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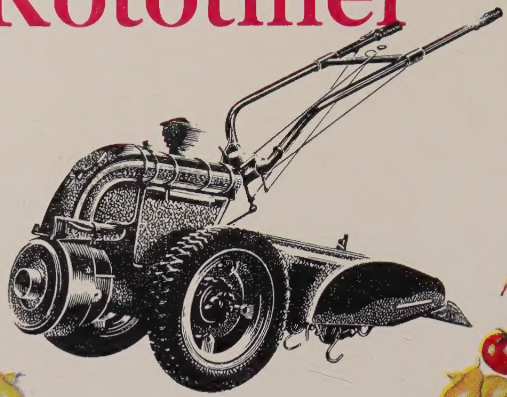

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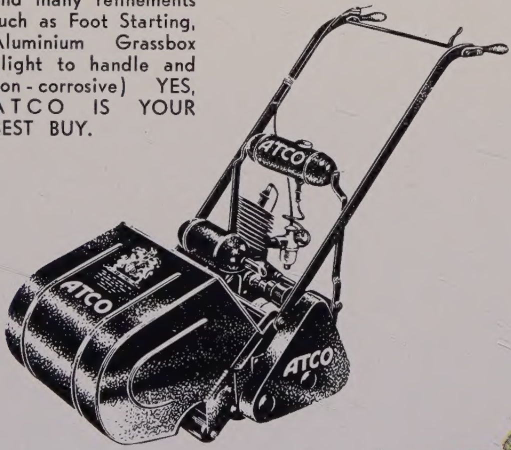

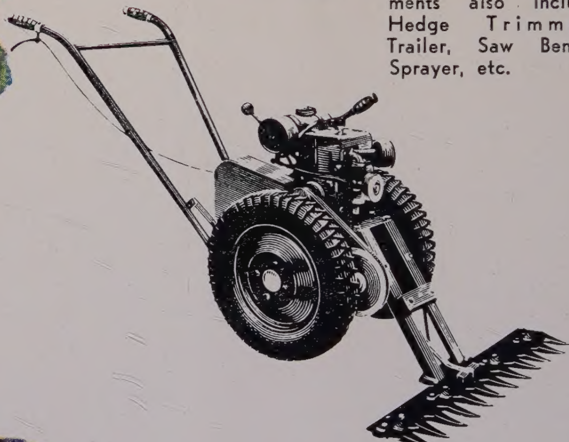

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This Month's Cover

In recent years between 4,000,000 and 5,000,000lb. of tobacco has been grown in New Zealand each season, all of it in the Nelson district. The total area in the crop has varied between 3500 and 4400 acres. The demand by manufacturers for New Zealand-grown leaf has increased steadily year by year and greater production is needed to meet their requirements. This month's cover, which has been reproduced from a colour photograph by Tom Lloyd, shows part of an experimental area at the Tobacco Research Station of the Department of Scientific and Industrial Research at Motueka. The workers are covering the flower heads of tobacco plants to prevent cross-pollination.

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REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

Disappointing Tests of Myxomatosis as Rabbit Control

By J. F. FILMER, Director, Animal Research Division, Department of Agriculture, Wellington

IN the summer of 1950-51 a virus disease called myxomatosis was used with spectacular success for controlling rabbits in south-eastern Australia, where it spread over a wide area and caused a very marked decrease in the rabbit population. It was consequently decided to conduct tests in New Zealand to discover if the disease would be of value for controlling rabbits here. Results of the tests reported below show that in no district did the disease spread far from the trial site; nor did it appear to persist through the winter, and the conclusion is drawn that it is unlikely to be of value in this country.

THE first symptom of myxomatosis is a discharge from the eyes, which usually occurs about a week after infection. This is followed by swellings on the head and under the tail. The rabbit becomes gradually weaker and generally dies in a week after the first symptoms appear. It is during this week that infection is transmitted to other rabbits, either by direct contact or by biting insects. Australian experience suggested that extensive outbreaks of the disease occurred only where mosquitoes or other biting insects were present in large numbers over several weeks. The first New Zealand trials were therefore conducted in the summer of 1951 in the hope that mosquitoes and sandflies would spread the disease.

The general design of the trials was the same in each case. Approximately 20 rabbits were infected by injecting the virus under the skin. Half of these were earmarked and released and the other half maintained in a wire netting enclosure. This was situated in an area densely infested with rabbits and where possible near water in which mosquitoes or sandflies might be expected to breed. When the first batch of rabbits showed symptoms a further lot were infected by rubbing discharge from the diseased rabbits under their eyelids. They were kept in the enclosure until they too showed symptoms, usually within a week of infection. In some cases further batches of rabbits were caught and infected at about weekly intervals. As soon as rabbits showed symptoms pairs of them were placed in small wire cages and these were taken to feeding grounds and moved frequently to cover as wide an area as possible.

HEADING PHOTOGRAPH: Australian scientists injecting myxomatosis virus into a rabbit to determine the disease's effect under given conditions. Australian Official photograph.

1951-52 Tests

The results of the 1951-52 tests may be summarised as follows:—

Ti Kokopu Block, about 5 miles east of Helensville. Thirty-one rabbits were infected between 19 November and 17 December. A few rabbits died near the site of the trial, but no naturally infected rabbits were caught. There was no decrease in rabbit population.

Aotea, coastal area to the north of Aotea Harbour. Fifty-six rabbits were infected between 13 November and the end of December. A number of dead carcasses were found in the area where infected rabbits were released and there was a definite decrease in rabbit population in this area. However, no naturally infected rabbits were caught. There was no decrease in the rabbit population on adjoining areas within a mile of the place where infected rabbits had been released.

Broadlands, south of Reporoa, near the junction of the Waikato and

Waiotapu Rivers. Between 12 November and the end of February 152 rabbits were infected. A few naturally infected rabbits were caught and a noticeable decrease in rabbit population was reported.

Hautu Prison Farm, near Turangi, south-east of Lake Taupo. In all 351 rabbits were artificially infected and released or exposed in heavily infested areas between 22 November and 29 February. A few un-earmarked rabbits were caught which showed definite symptoms of myxomatosis and a few more were seen, but there was no noticeable reduction in the rabbit population.

Kiore, about 25 miles south-east of Waitara, Taranaki. Sixteen rabbits were inoculated on 20 November and there were no further inoculations. No naturally infected rabbits were seen and there was no observable decrease in rabbit population.

Waitotara, coastal sandhills. Thirteen rabbits were inoculated on 20 November and there were no other inoculations. No natural transmission was observed.

Flock House Estate, near Bulls. Between 21 November and 20 January 125 rabbits were infected. No naturally infected rabbits were found and there was no observable decrease in rabbit population. Although mosquitoes were reported active, the disease was not transmitted to rabbits penned within 300yds. of the enclosure in which infected rabbits were kept.

Aohanga, coastal area near the mouth of the Aohanga River, due east of Eketahuna. Eighty-nine rabbits were infected between 22 November and the end of December. Naturally infected rabbits were seen and some were caught during December, January, and February. There was, however, no observable decrease in rabbit population. On 1 February three infected rabbits were shot in a very heavily infested area. It was obvious that although some transmission had taken place, there was no effective spread of the disease.

Whareama, an area about 5 miles from the mouth of the Whareama River, east of Masterton. Twenty-three rabbits were infected between 23 November and 12 December. No natural transmission of the disease was observed.

Ben Ohau, about 5 miles south from Lake Pukaki. No record was kept of the number of rabbits infected, but the disease was maintained from 4 October until the end of March. No natural spread of infection was observed.

Gray's Hills, near the junction of the Waitaki and Stony Rivers, about 50 miles west of Timaru.

Haldon, east bank of the Waitaki River about 10 miles south of Gray's Hills.

A total of 753 rabbits were infected at the above two sites between 27 November and the end of March. At Gray's Hills the infected rabbits were released at the foot of a heavily infested stony rise. The disease spread rapidly on this rise and there was a considerable reduction in the rabbit population. The disease, however, did not spread to other adjacent infested areas and only a few naturally infected rabbits were found at Haldon.

Tara Hills, about 5 miles south of Omarama. Sixty-eight rabbits were infected between 29 November and the end of January. No natural transmission was observed.

Long Acre, just south of Lindis Pass. Thirty-one rabbits were infected between 29 November and the end of December. No natural transmission was observed.

Hakataramea, an area on the east side of the Hakataramea River about 10 miles north of Kurow. Approximately 80 rabbits were infected between 28 November and 29 February. No natural transmission was observed.

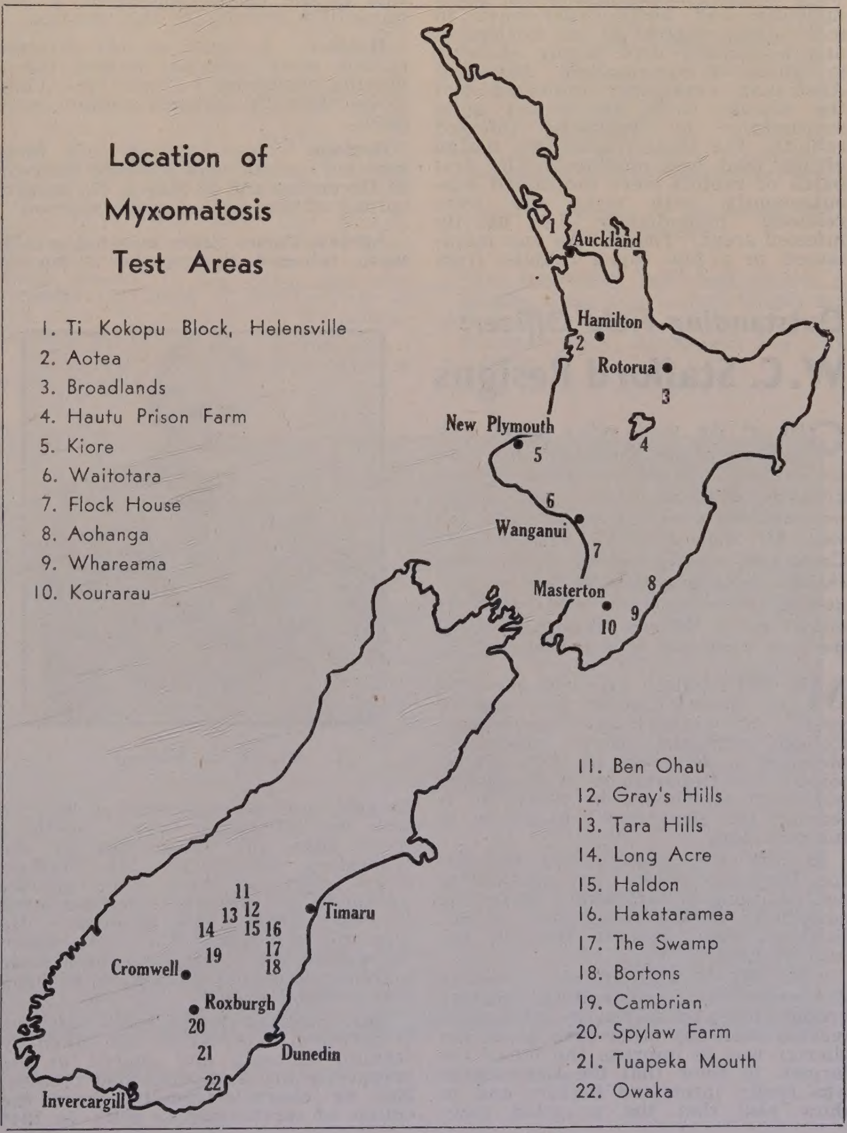
The Swamp, about 10 miles east of Kurow, on the north bank of the Waitaki River. Approximately 180 rabbits were infected between 28 November and 29 February. No natural transmission was observed.

Bortons, an area on the south side of the Waitaki River about 15 miles north-west of Oamaru. Over 100 rabbits were infected between 29 November and the end of March. A number of naturally infected rabbits were seen during January and February, and the owner of the property considered that the disease had kept numbers down to some extent, but rabbits were still very numerous in March. The disease did not spread to adjoining properties.

Cambrian, common land about 20 miles north-west of Ranfurly. Twenty-nine rabbits were infected between 30 November and 20 December. No natural transmission was observed.

Spylaw Farm, about 15 miles south of Roxburgh. Seventy-nine rabbits were infected at two sites between 30 November and 18 December. Some natural transmission was reported during January and February and there was a marked reduction in the rabbit population in one gully in which infected rabbits were exposed. There was no spread of the disease to badly infested gullies only ½ mile away.

Tuapeka Mouth, about 10 miles south-west of Lawrence. About 500 rabbits were infected and released at several sites in this area during December, January, and February.



Very few naturally infected rabbits were observed, but an obvious reduction in rabbit population was reported in one gully where about 300 infected rabbits were released.

Owaka, about 20 miles south of Balclutha. Sixty rabbits were infected between 1 December and 15 February. Naturally infected rabbits were caught at several places up to 10 miles from the site of the trial. It is possible that this spread occurred through the distribution of infected rabbits. In only one place did any material reduction in rabbit population occur.

The weather during the period of the trials was unusually cold and wet in most areas, and this probably reduced the numbers of mosquitoes and sandflies, which were rarely plentiful.

Trials in 1952-53

Because of unfavourable weather during the 1951-52 trials it was decided to conduct a smaller series of trials during the summer of 1952-53 in areas where the most promising results were obtained in the first series. Some difficulty had been experienced in maintaining rabbits in the enclosures and a number died before showing symptoms of myxomatosis. Moreover Australian experience indicated that the disease could be spread quite successfully by releasing infected rabbits. For these reasons the design of the trial was modified. The first batch of rabbits were inoculated subcutaneously with virus and were released immediately in heavily infested areas. The disease was maintained in a few caged rabbits, from which further batches were infected by eye-to-eye transmission and released.

The following is a summary of the 1952-53 trials:—

Aotea. An unrecorded number of infected rabbits were released on four occasions between 11 December and 12 March. Some decrease in rabbit population was reported, but no evidence of spread of the disease was obtained. Mosquitoes and sandflies were reported to be very numerous.

Hautu Prison Farm. A total of 97 infected rabbits were released between 9 December and 28 February. There was no evidence of any spread of the disease.

Aohanga. A total of 130 infected rabbits were released between 19 November and the end of February 1953. No natural spread of the disease was observed.

Kourarau, near Gladstone in the Wairarapa district. A total of 300 infected rabbits were released during the 2 months beginning 18 November. There was some natural transmission of the disease and a temporary reduction in the rabbit population in the immediate vicinity of the releases.

Haldon. A total of 163 infected rabbits were released during the 3 months beginning 8 December. Only three naturally infected rabbits were seen.

Bortons. One hundred and forty infected rabbits were released between 21 December and 22 March. No natural spread of the disease was observed.

Spylaw Farm. Sixty infected rabbits were released during the 2 months beginning 4 December. A number of naturally infected rabbits were seen and there was a marked reduction in rabbit population in the trial gully, but the disease did not spread to adjacent heavily infested areas.

Owaka. Over 200 infected rabbits were released between 4 December and the end of April. No naturally infected rabbits were seen, but a marked decrease in rabbit population was reported in the area where releases were made, but this was limited to a small area.

The results of the 2 years' trials with myxomatosis in New Zealand have been disappointing. Although natural transmission occurred in some areas and achieved a local reduction in rabbit population, in no district did the disease spread far from the trial site. The disease did not appear to persist through the winter in any area in either year. Reasons for the failure to spread are not readily apparent. In some areas mosquitoes and sandflies were plentiful during the trials, and, as has been indicated, some natural transmission occurred.

It is considered that the disease was given a fair trial in a number of widely distributed rabbit-infested areas, and it therefore seems unlikely that myxomatosis will prove of great value in controlling rabbits in New Zealand.

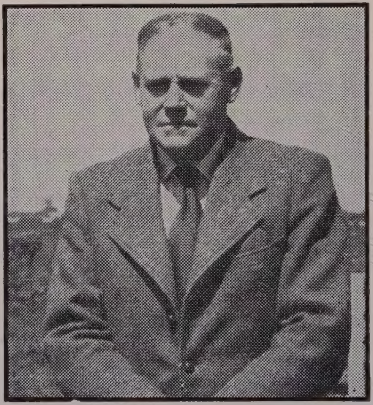
Acknowledgment

Officers of the Animal Industry Division of the Department of Agriculture, rabbit inspectors, and a number of farmers co-operated wholeheartedly and the failure of the trials was certainly not due to any lack of enthusiasm on their part. The virus was supplied by the Department of Agriculture Animal Research Station, Wallaceville.

Outstanding Field Officer:

W. C. Stafford Resigns

ONE of the most widely known field officers of the Department of Agriculture, W. C. Stafford, Irrigation Officer, Extension Division, Timaru, has resigned from the Department after 26 years' service. Mr. Stafford in his 22 years in South Canterbury is freely credited with initiating changes in farming methods that led to a general rise in fertility in farmlands of the district and to the area's becoming one of the most prosperous in New Zealand.



Mr. W. C. Stafford.

MR. STAFFORD, who was educated at Christ's College and spent 3 years at Canterbury Agricultural College, Lincoln, from which he obtained a Diploma in Agriculture, joined the Department in Blenheim, but went to Timaru in 1931. He is leaving the Department to go on to his own farm.

In 1949 Mr. Stafford was awarded the Bledisloe Medal for outstanding contributions to agriculture. Referring editorially to the resignation of Mr. Stafford, the "Timaru Herald" has said of him:—

" . . . Mr. W. C. Stafford . . . has in 22 years of outstanding service brought more prosperity to South Canterbury than any other citizen. . . . His charter was to improve the lot of the farmer, to show that the Department was really interested in him and to show also that the so-called newfangled notions agricultural science was fast producing were something more than the imaginings of the laboratory technician. Mr. Stafford never deviated from that charter except to add practical common sense to every formula for progress. He won the confidence of all with whom he worked and at the same time made a tremendous contribution to the local and national good.

"Mr. Stafford could have left the Department many years ago, taken up farming himself, and shared in the prosperity his confidence had created. But he characteristically chose the course of service before self. In 1944 when he had a record of achievement of work well done and no one could question his desire to go farming, he took up land. He submitted his resignation to the Department, but it paid him the high compliment of refusing to accept it. He carried on and spent what little spare time he had on his farm. . . .

"As a young officer in Timaru Mr. Stafford set out to give farmers a background of pasture so that they could build up the fertility of their land sufficiently to support crops. Rotation, he said, could be planned ahead with the idea that the farmers were farming their farms and the farms were not farming them. . . .

"Mr. Stafford's encouragement of seed certification in South Canterbury would alone be a monument to his skill, foresight, and industry. He made this district one of the finest seed-beds in New Zealand and the many farmers who readily took his advice never regretted it. His pasture work too was of such consistently high standard that today South Canterbury pastures are the equal of the best in the world.

". . . when Mr. Stafford . . . joins the ranks of the farming community of which he has always been an ex-officio member, he will modestly survey his accomplishments as a duty done to the best of his ability. He will have the satisfaction of knowing that the co-operation of farmers' organisations, the Department of Agriculture, and the merchants is unique in South Canterbury and that he has been the moving spirit behind it. . . ."

Pre-harvest Examination of Ryegrass Seed for Blind Seed Disease

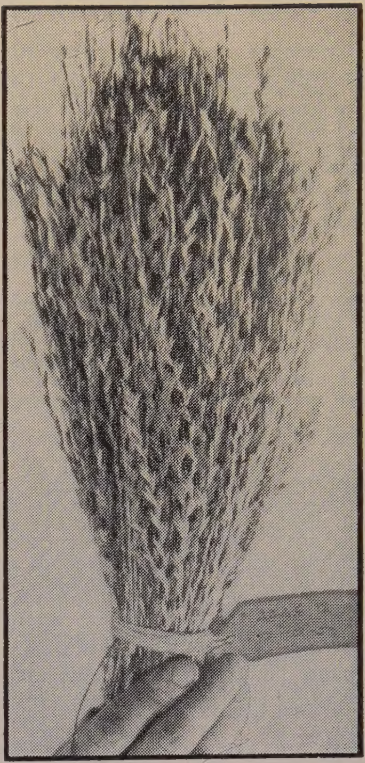
THE Seed Testing Station of the Department of Agriculture is this year again undertaking the pre-harvest examination of samples of ryegrass for infection with blind seed disease. For this purpose a sub-station will be opened at the offices of the Department of Agriculture in Timaru from 15 December to handle samples from the South Island. This service has now been provided for a number of years and has been of considerable assistance to farmers and merchants by enabling a forecast to be made of the germinating prospects of the seed which might be harvested from any particular crop of ryegrass. Examination procedure is described by A. V. Lithgow, Officer in Charge, Department of Agriculture Seed Testing Station, Palmerston North, in the first section of this article. The section which deals with blind seed disease is by K. Cottier, Instructor in Agriculture, Department of Agriculture, Wellington.

EXPERIENCE has shown that it is not worth while testing samples when they are taken from crops earlier than a week before cutting, as the disease can spread up to the time the seed is mature. The results on immature samples are not reliable, as if wet weather follows after a sample has been drawn, rapid spread of the disease may occur. In these circumstances it is recommended that a further sample be submitted to obtain an up-to-date result, particularly if the earlier sample has already shown some infection.

When a grower decides to sample his paddock for testing he should draw the sample so that it is as representative as possible of the area from which it is taken. It is advisable to traverse the whole area picking a seed stalk every few paces. The sample should comprise 400 to 500 seed heads, which should be trimmed to about 10in. in length, and a label with the sender's name, address, and telephone number in block letters should be attached. The date of sampling and the registered number of the area under certification (if applicable) should also be given. The sample should be wrapped tightly in several layers of paper to keep it fresh.

It is important that growers should forward their samples without delay once they are collected, as samples deteriorate fairly quickly in transit. All North Island samples and those South Island samples posted before 12 December should be sent to the Seed Testing Station, P.O. Box 609, Palmerston North, and South Island samples sent after 12 December should be forwarded to the Department of Agriculture, P.O. Box 110, Timaru. The reports on the samples indicate the relative degree of infection of the seeds present in the heads and also indicate the stage of development of the seed. For this purpose the following terms are used:—

Flowering (anthers still present in half of the flowers).



Sample of ryegrass for pre-harvest test for blind seed.

Very immature (seed half length).

Middle stage (up to full length but still milky).

Mature (fully developed but still doughy).

Ripe (mature and dry).

Heavier crops of ryegrass are likely to be less infected with blind seed disease.

Experience has shown that where the sample has been carefully taken and cutting takes place shortly afterward the pre-harvest report gives a good indication of what the final germination of the line might be. It is not considered economic to harvest a paddock which under these conditions shows an infection of over three-tenths.

Blind Seed Disease

SINCE the causative organism of blind seed disease of ryegrass was discovered in New Zealand 20 years ago many avenues of investigation have been explored in an effort to find some means of controlling the disease.

Lines of Research

One line of research has been the possibility of breeding a desirable type of ryegrass which is resistant to blind seed disease. Certain strains of ryegrass were until recently regarded as resistant, although otherwise not of a desirable type. It was thought that such resistance could be combined by breeding with the other qualities desirable in commercial ryegrass. It has now been shown, however, through more refined inoculating techniques, that the "resistant" strains are in fact highly susceptible if inoculated at the correct stage—when the florets are open. In the field these plants may not normally become infected, because through features associated with the length and time of flowering they escape infection. Such escape mechanisms might, of course, prove valuable factors to incorporate into the best strain of ryegrass.

Control through the use of fungicidal treatments has also been investigated. Sprays and dusts applied at flowering time have given a measure of control, but the best control achieved has not been sufficient for it to be considered a worthwhile, economic treatment.

Nitrogenous fertilisers have been shown to be an efficient means of increasing seed yields, but there is no evidence that nitrogenous fertilisers will affect the incidence of blind seed disease.

Farm management methods have also been investigated. There is no doubt that the time at which fields are closed for seed production has an effect not only on yields, but on germination. Germinations as well as yields were much reduced in a series of trials when fields were closed later than the end of October.

Overseas workers stress the importance of crop hygiene with this disease—the use of clean seed and the elimination of sources of infection of blind seed disease from the vicinity; that is, ryegrass in nearby paddocks, headlands, and roadsides should not be allowed to seed. In New Zealand it has been amply demonstrated that the infecting spores are present in the atmosphere for considerable periods during the flowering of ryegrass, and the dangers of air-borne infection are great, particularly in weather favourable to the development of the disease.

Some trials have been conducted to investigate how closely field germinations from seed sown correspond with the germination tests normally carried out in the seed testing laboratory. Germination counts were made on a number of seed lines each of which was germinated under field, glasshouse, and laboratory conditions. The results showed close correlation. Farmers can be reassured that the laboratory figures give a reliable pointer to the maximum strike which can be expected under the best germinating conditions in the field.

For three seasons (1948-49 to 1950-51) Instructors of the Department of Agriculture have prepared information on the growing conditions of ryegrass seed crops at the time of routine inspection for certification. Subsequently the yields and germinations of machine-dressed seed from these crops were obtained. Approximately 2500 crops of perennial ryegrass and 1100 of short-rotation ryegrass were surveyed. The information was analysed in an endeavour to isolate factors affecting seed germination. The following conclusions were reached:—

Meteorological Records for September

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	55.4	+ 1.6	70.3	34.2	1.57	17	− 3.57	0.47	23	163.0
Auckland	160	56.1	+ 1.6	66.6	45.0	1.37	18	− 2.42	0.24	7	154.7
Tauranga	10	54.4	+ 1.9	67.2	36.7	2.95	12	− 1.27	1.83	1	205.9
Ruakura	131	52.7	+ 1.8	66.8	32.9	1.56	16	− 2.12	0.34	12	167.7
Rotorua	969	51.6	+ 1.9	65.0	34.9	3.11	11	− 1.46	0.93	1	172.2
Gisborne	12	53.4	+ 1.3	72.2	28.6	1.18	8	− 1.44	0.60	25	209.1
New Plymouth ..	160	52.8	+ 1.1	61.0	39.8	4.61	18	− 0.29	1.05	23	174.2
Napier	5	55.0	+ 3.0	75.6	34.7	0.91	7	− 1.06	0.24	30	226.0
Karioi	2125	45.8	+ 0.8	62.0	25.0	3.12	16	− 1.15	0.52	12	
Wanganui	72	53.6	+ 1.5	67.9	36.1	3.24	16	+ 0.70	0.50	3	176.5
Palmerston North .	110	52.4	+ 1.9	64.5	33.2	3.69	19	+ 0.68	0.65	7	135.6
Waingawa	340	51.0	+ 1.7	66.0	32.0	3.67	18	+ 0.40	0.91	12	185.2
Wellington	415	51.2	+ 1.3	65.3	37.4	3.30	12	− 0.54	1.26	12	168.3
Nelson airfield ..	5	49.2	+ 1.0	64.5	31.4	2.53	11	− 0.63	0.66	23	193.4
Blenheim	12	51.0	+ 0.3	69.9	31.1	2.16	11	− 0.12	0.61	12	225.3
Hokitika	15	47.8	+ 0.0	64.1	31.5	9.66	23	+ 1.04	2.40	6	145.8
Hanmer	1270	46.6	+ 0.5	68.5	27.2	3.37	13	− 1.06	1.04	11	186.2
Christchurch ..	22	49.8	+ 1.1	74.2	28.9	1.40	9	− 0.66	0.55	30	219.9
Ashburton	323	50.0	+ 2.1	73.4	27.4	1.59	10	− 1.03	0.61	25	217.1
Timaru	56	49.2	+ 1.3	73.1	29.8	1.40	8	− 0.55	0.49	25	204.9
Alexandra	520	48.0	+ 0.9	70.1	23.1	0.53	8	− 0.29	0.13	6	202.5
Taieri	80	48.0	+ 0.3	72.2	25.5	1.47	11	− 0.46	0.29	23	186.0
Invercargill airfield	0	46.2	+ 0.5	66.0	25.1	4.43	18	+ 1.21	0.68	24	120.3

1. Season and district are two of the most important factors associated with the incidence of blind seed disease. The critical period for infection is when flowering is taking place. When this period is also one of considerable rainfall, infection is likely to occur, with resultant low germination. In the survey the number of rain days in the period of flowering in districts with high resultant germination was less than half that in districts of low-germinating crops. In these cases rainfall data outside the flowering period were similar. The district effect, which is probably closely bound up with weather, was shown by the low germination obtained in most seasons in South Otago and Southland.

2. There was no strong evidence to suggest that germination was greatly affected by the vegetative condition of the crop; that is, whether the crop was heavy, medium, or thin.

3. In some crops lodging improved the germination, the difference being about 20 per cent. between upright crops and those completely lodged. This effect was more consistent with short-rotation ryegrass.

4. There was no clear indication that the amount of bottom growth in crops had any effect on germination.

5. The percentage of grass in the sward had some effect on germination; in some crops there was an increase of 5 per cent. in germination with a 10 per cent. increase of grass.

6. In practically all cases high-yielding crops had better germination. This was more marked with perennial ryegrass, in which an increase of 10 bushels per acre in yield was accompanied by an increase of 5 per cent. in germination. This effect is probably correlated with some of the other factors. Many high-yielding crops were lodged, very heavy, and had a high percentage of grass in the sward. Nevertheless it is likely that efforts to increase yield of seed are also likely to result in better germination.

Effects Can be Minimised

Despite the wide scope of investigations to date into blind seed disease, the immediate future offers little to the farmer in practical means of avoiding the disease. If seasonal conditions are against the grower, there is little that can be done. However, the effects of the disease can be minimised by the adoption of practices that will, in most cases, give good yields of seed: Early closing, adequate fertiliser (especially nitrogenous), and saving of seed from vigorous crops. Nevertheless, some progress has been made, and investigations are being continued in the hope that the future will bring a means of combating blind seed disease more successfully than has been possible in the past.

Making the Most of the Home Vegetable Garden Area

THE planting of the vegetable garden should be planned so that there is a good supply of a variety of fresh vegetables over as long a period of the year as the climate will allow. Many enthusiastic home gardeners start the season with this in mind, but enthusiasm is often too great in early spring and the objective of having a continuing supply throughout the year is lost because all the ground is planted up early. For this reason most gardeners have experienced a glut of one kind of vegetable and have been forced to destroy the surplus only to find a few weeks later that there is a shortage. A little time spent in winter evenings in estimating the family's vegetable requirements for the year and planning the garden accordingly can reduce gluts and periods of shortage. Admittedly many gardens will be too small to meet all the needs of the family, but every endeavour should be made to approach this requirement. In the first section of this article R. Pengelly, Assistant Vegetable Specialist, Department of Agriculture, Wellington, gives a few hints on how to increase the annual production in the home garden and to ensure a supply of fresh vegetables over the greater part of the year. The section on routine work for December is by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland.

VEGETABLES are of value as a source of roughage which promotes digestion and aids elimination from the body, and as important sources of minerals and vitamins. The housewife knows that wilting reduces palatability, but may not realise that it also causes an appreciable loss of the vitamin content of many vegetables. Vegetables at their best are seldom found in shop windows.

The cook's golden rule should be to delay harvesting vegetables until just before use. Root crops, potatoes, and onions are exceptions, as they lose little of their nutritive value during storage, even over a fairly long period, though some of the vitamin C is lost.

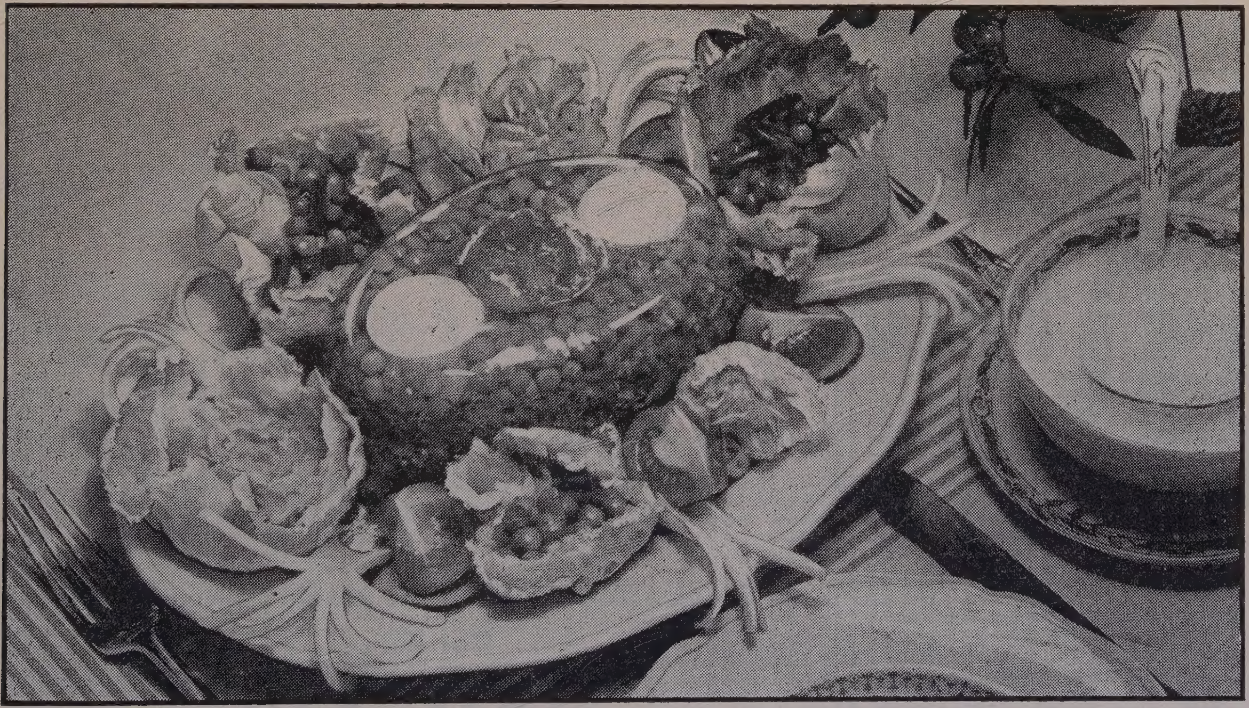
What to Grow

Obviously, close co-operation between the gardener and the cook is essential to obtain the best results from the garden. Emphasis should be placed on growing the most desired vegetables in sufficient quantities to ensure adequate supplies without undue waste. The choice will be restricted to some extent by the nature and condition of the soil. For instance, when breaking in a new section which has a stiff and sticky clay the home gardener would be well advised not to try to grow root crops until sufficient organic matter has been dug in and the soil has become friable. When the soil has been well worked for a year or two and is in good heart it will grow most kinds of vegetables satisfactorily, whether it is a light, a medium, or a heavy soil.

The greatest limiting factor to choice will be the area of land available. It takes approximately ¼ acre to grow sufficient vegetables to supply all the needs of a family of 6 persons all the year round. It is the exception to find this area on a city section; in fact the land available for the growing of vegetables seldom exceeds 1/16 acre.

The following information on food value may assist in the selection of the best vegetables to grow. Not only are the perishable vegetables, such as lettuce and peas, much more delicious when gathered fresh from the garden, but lettuces in particular lose their vitamin content in storage. Conversely root vegetables, such as main-crop carrots, do not differ much whether bought from the shop or taken direct from the garden. The storage treatment of potatoes, root crops, onions, marrows, and pumpkins on the farm before their sale and appearance in the shop window is possibly better than that which the home gardener can provide.

Vitamin C is readily lost from green, leafy vegetables during storage at ordinary temperatures. Lettuce, for instance, may lose as much as 50 per cent. of its vitamin C content during



[*Sparrow*

Vegetables are more nutritious and more palatable when fresh. If the garden area is very limited, preference should be given to perishable salad crops.

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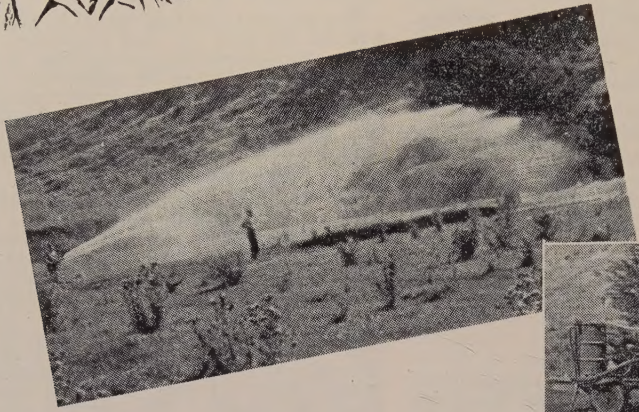

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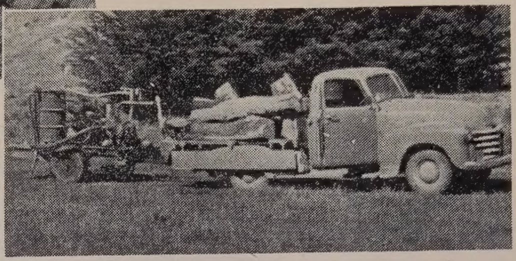

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Companion cropping. Ridges of a leek trench used for growing lettuces. The same system could be used with a celery trench.

the first day after picking and as much as 90 per cent. within 3 days. Since the rate of loss is reduced by storage at low temperatures, use should be made of refrigerator or ice chest to hold these leafy vegetables if a short period of storage is unavoidable. The vitamin B complex and vitamin C are readily soluble in water, and indeed much is dissolved and lost when the vegetables are boiled, unless the cooking water is used in soups, gravies, or sauces. Vitamin A, of which yellow and green vegetables are good sources, is not soluble in water and is therefore not lost into the cooking water.

Dehydration reduces vitamin content, particularly that of vitamin C. The food value, vitamin content, and palatability of freshly picked vegetables are higher than those of any form of processed vegetables. Hence if the number of kinds of vegetables in the garden must be restricted, the first choice should be leafy vegetables, peas, and beans, and the last to be considered should be root crops, onions, pumpkins, and potatoes. Spring carrots, beetroot, and spring onions which are needed for salads can be grown in small quantities for this purpose.

Garden Plans

Numerous ready-made garden plans may be found in gardening books and catalogues, but the majority have been drawn up to suit the climate of England or the U.S.A. and few are completely applicable to the New Zealand climate, which itself is very varied from Northland to Southland. Further, gardens are a variety of sizes and shapes and any gardening plan must be modified to suit each garden. Garden planning can be carried out in a reasonable manner only with a full knowledge of the garden to be planned.

Cropping Terms

The following brief explanation and discussion of some cropping terms used by commercial growers should be helpful to the home gardener in planning his programme.

Rotation

Rotation may be defined as a systematic arrangement for the growing of different crops in a more or less regular sequence on the same land. A complete rotation usually takes 3 or 4 years. The necessity of crop rotation for successful farming has long been known, but is far too often overrated when used in relation to vegetable growing.

Heavy fertiliser applications are seldom applied to the large fields of farm land, but success can be achieved in intensive vegetable growing only if the grower is prepared to manure the ground well. Different crops deplete the soil of its mineral elements in varying proportions. If crop rotations were not practised, the soil might well become exhausted of some elements and be unable to produce a satisfactory stand of a crop that has been grown for a number of years. Many vegetable crops take only about 3 months to mature from seed and thus more than one crop can be grown on the same piece of land each year if climatic conditions are favourable.

Usually crops will be rotated automatically on market gardens without any obvious effort to plan a rotation, and the organic and inorganic fertiliser dressings will replenish the supply of the major nutrients extracted by the previous crop.

Home gardeners should liberally fertilise their land regularly to obtain the maximum yield of first-grade produce possible from the area available. This heavy feeding of the soil does away with the need for planned crop rotation except when disease becomes a factor on a certain part of the land and so precludes the growing of that particular crop continuously. However, crop rotation is beneficial. It should be practised reasonably where possible. For example, leaf crops should be followed by root crops and these by legumes before leaf crops are grown again. But it is not necessary to refrain from growing a vegetable because the only land available is where this particular crop was grown the previous year.

Succession Cropping

Succession cropping is the growing of two or more crops on the same land in the one growing season. The adoption of a system of succession cropping is most important for home gardeners where space is very limited, because only by this means can the maximum production from a limited area be approached.

Numerous examples of succession cropping could be listed, but all would not be applicable for all places in New Zealand. It is necessary for the home gardener to familiarise himself with the peculiarities of his district to learn what crops it is possible to grow and when they should be planted for best results. The crops grown by nearby commercial gardeners can form a basis for the home garden cropping plan, but there will be many other crops which can be grown, because commercial growers are not likely to produce crops which cannot be handled by mechanised planters or harvesters or those for which there is not a good demand.

A guide as to the best time to sow or plant any particular vegetable in a particular district can be obtained from the tables on pages 66 and 67 of the July 1952 issue of the "Journal" or from the Department of Agriculture pamphlet "Vegetables for Health", which is available from seedsmen or offices of the Department.

The following are examples of succession cropping:—

1. Early carrots or beetroot followed by dwarf beans.

2. Early lettuce or radishes followed by dwarf beans and these by turnips or prickly spinach.

3. Early potatoes followed by late cabbage.

The principle of succession cropping is excellent provided it is not carried to extremes. Land must be deeply dug from time to time and it must have some rest periods, although these may be very much shorter than in normal farming practice. It is important, therefore, that cropping should be planned so that an adequate interval is allowed periodically for the necessary digging, aerating, and resettlement of the soil.

Succession sowing or planting is the sowing or planting of the same crop at intervals during the one growing season. This practice involves sowing little and often. Home gardeners can avoid waste by planting at intervals only part rows of such vegetables as lettuces, cabbages, cauliflowers, spring carrots, spinach, and beetroot, and so ensure a continuing supply over a longer period. Only single rows of peas should be sown and the picking done regularly to prolong the cropping.

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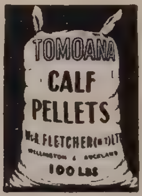

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[*Sparrow*

Succession planting has not been practised here; most of the cabbages are maturing at the one time and wastage is inevitable.

As the season progresses it is often best to grow a different variety from that sown for the early crop. Many home gardeners may be bewildered by the multitude of varieties available in seed shops or listed in catalogues from which they must make their choice. Over the years many selections have been made from certain vegetable varieties, and each of these may have been given a different name. It is encouraging to know that selections are continually being made, but the claims for these new strains are often greatly exaggerated. The crop from more expensive seed may not be as good as that of the old, proven variety from which it was selected. Gardeners should not let impressive-sounding names alone sway them in their choice of vegetable varieties.

As an example of successional sowing, recommended pea varieties for various seasons are listed below. (Synonymous names for the same variety are shown in parentheses.)

Early Season

Little Marvel (Utility)
William Massey (Kelvedon Wonder)

Mid-season

Greenfeast (Lincoln)
Onward (Southern Cross)
Stratagem

Late

Alderman (Duke of Albany)

Different varieties of cauliflowers may take from about 3 to 10 months to reach maturity. Thus by careful choice of varieties and by the planting of only a few of each it would be possible to ensure a succession of this crop over the greater part of the year. However, it would not be reasonable for a home gardener to plant part of his limited area with varieties requiring many months to mature. Where space does not have to be considered, or if the variety will mature in winter, when perhaps the land could not be better used for other crops, the practice might be desirable.

Inter-cropping

Inter-cropping is the growing of one crop, usually a quick-maturing kind, between the plants of another crop in the same row. As an example broad beans may be sown in the early potato rows, one broad bean seed being placed between every two tubers. The beans will start into growth earlier

Favoured Succession Crops

EARLIEST

Crop	Recommended variety
Beetroot	Detroit Red
Cabbage (plants)	Golden Acre
Carrots	Chantenay
Lettuce	Imperial 615 (large) or Neapolitan
Peas	William Massey or Little Marvel
Potatoes	Arran Banner or Epicure
Radish	French Breakfast or White Icicle
Spinach	Prickly
Turnip	White Stone

LATE*

Beetroot	Detroit Red
Carrots	Chantenay
Peas	Alderman
Spinach	Prickly
Turnip	White Stone

MAIN CROP

Crop	Recommended variety
Beans (dwarf)	The Prince
Beans (runner)	Fardenlosa or Scarlet Runner
Beetroot	Detroit Red
Brussels sprouts	Fillbasket
Cabbage	Savoy
Cauliflower	Phenomenal Maincrop or Phenomenal (5 months)
Celery (plants)	Golden Self-blanching
Cucumber	Long Prickly
Kohl rabi	Purple or green
Lettuce	Great Lakes
Marrow	White or green
Peas	Greenfeast, Stratagem, Onward
Potatoes	Aucklander Short Top
Pumpkin	Crown, Queensland Blue, or Triamble
Spinach	New Zealand (perpetual)
Swede	Superlative
Sweet corn	Golden Cross Bantam
Tomato (dwarf)	Stoners Dwarf Gem
Tomato (tall)	Moneymaker
Turnip	White Stone

* It is advisable to buy seed of late varieties when the main purchases of seeds are being made, because later in the season a preferred variety may have been sold out.

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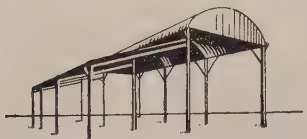

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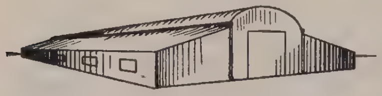

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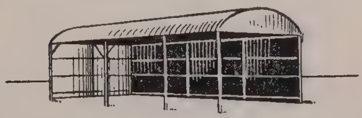

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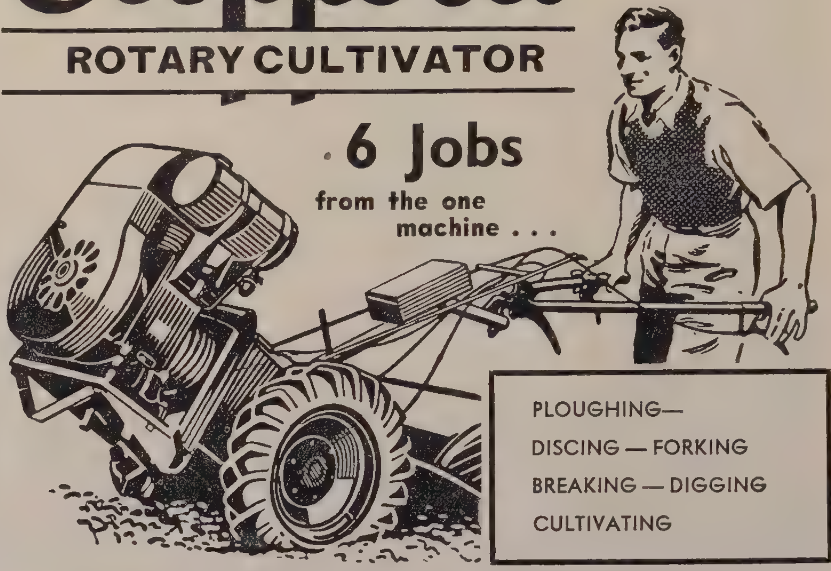

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than the potatoes, and because of their habit of growth will stand reasonably clear of the potato haulms. This provides an attractive way of getting a fair crop of broad beans without devoting a special patch of ground to them.

Companion Cropping

When a crop is sown between the rows of another crop at the outset the practice is more correctly termed companion cropping than inter-cropping.

Cabbages, lettuces, and radishes may be grown together, the lettuces between the rows of cabbages and the radishes between the cabbage plants in the rows. The radishes mature and are removed first and then the lettuces will follow. Both will be out of the way before the cabbages need all of the space.

Turnips sown between rows of peas, and lettuces planted on the sides of ridges formed by digging out celery trenches or on newly formed asparagus beds are other suggested arrangements worth a trial. In any type of inter-cropping or companion cropping the main crop should not be jeopardised by poor management.

Catch Cropping

Catch cropping is commonly confused with inter-cropping, but is a different operation. Catch cropping properly consists of taking a quick-growing crop off ground which is vacant only for a short period.

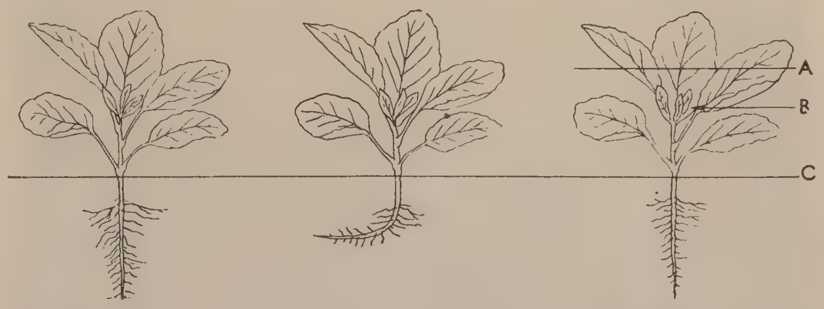
If it is desired to grow a particular crop, for instance onions, on a piece of well-manured ground, but experience has shown that it is best to delay sowing for a month to obtain the best crop, the land might well be used in the meantime to grow a quick-maturing crop such as radishes or turnips. The rows of the catch crop should be spaced as for the main crop so that the latter can be sown between the rows of the catch crop if it has not been harvested.

The suggestions already made may assist home gardeners to make the best use of their land by planning beforehand where to grow the various crops. Some of the cropping systems mentioned are novel, but employment of them should add a little interest to vegetable gardening.

Where home gardens are small the practices of succession cropping, inter-cropping, and companion cropping can do more than anything else to offset space limitations.

Work for December

With the main holiday period approaching, when many home gardens will be left unattended for some time, there will be much important work to do in December to put gardens in good order before holidays begin. Thinning, weeding, hoeing, spraying, and planting must be brought up to date. In the larger well-planned gardens there should still be room for seasonal crops, but by the end of the month gardens should be full of vegetables, some newly planted and others at different stages of maturity.



Transplanting brassicas. Left—The correct way to plant. Middle—The incorrect method. The taproot is bent and this retards the flow of sap to the plant and results in slow growth and shallow root development, which are a disadvantage in dry soils. Right—The amount of transpiration can be reduced and plants kept from drooping unduly by cutting off the outer leaves. A—The level to which leaves should be cut. B—Young leaves in the centre, which should not be touched. C—Depth to which plants should be set.

In a small garden where planting space is limited inter-planting may be done successfully, provided quick-maturing vegetables such as lettuces, radishes, and spinach are planted between rows of vegetables that take longer to mature. Cabbages, cauliflowers, and root crops may be planted between rows of maturing potatoes, peas, and beans, and pumpkins, cucumbers, and melons may be inter-planted with sweet corn. Tender vegetable plants such as tomatoes, peppers, and egg plants, which are prone to wind damage, particularly when young, may be planted to advantage between maturing crops of peas or cabbage, especially if the garden is exposed.

When a crop has been harvested no time should be lost in digging the plot over and preparing it for replanting. The new crop should be of a different family from the previous one, as best results are obtained by growing crops in rotation.

Earlier planted tomatoes will require tying to their supports, and the shoots growing from the leaf axils should be removed before they grow more than about 3in. long. In districts where blight is troublesome spraying the plants with Bordeaux mixture (4oz. of bluestone and 5¼oz. of hydrated lime to 4 gallons of water) or copper oxychloride should not be neglected. An insecticide such as D.D.D. 50 per cent. of wettable powder at ½oz. in 4 gallons of spray can be added for control of the tomato caterpillar.

Celery beds can be prepared and plants set out. Plants should be kept sprayed with Bordeaux mixture (at the same strength as for tomatoes) or

[*Green and Hahn*

Self-blanching celery from which the board has been removed to show the blanching stems. Seedlings set out now will mature very quickly if planted in a rich, moist, well-drained soil.

[*Sparrow*

Potato crops should be kept earthed up as they grow. The final moulding should be given before the foliage becomes so dense that working among it causes damage.

with copper oxychloride to protect them from leaf spot, caused by the fungus *Septoria apii*, which is one of the most serious diseases affecting celery.

Root crops such as parsnips and carrots should be thinned as soon as the plants are large enough to handle.

Weeding and hoeing should be attended to even among well-established crops. Weeds not only rob the plants of food and moisture, but are sometimes the hosts of diseases and insect pests.

From December until April it is an advantage to sow or plant all vegetables on flat beds rather than on ridges. This is important during the drier and warmer months, as it facilitates watering and liquid manuring. Such vegetables as leeks, brussels sprouts, and cabbage can be moulded up later as they grow.

Kumara plants will now be developing runners, which should be lifted occasionally to prevent them from developing roots in the soil. If they become attached to the soil, the vine growth will be excessive at the expense of tubers. The soil should be kept moulded up, to maintain the ridges in which the tubers form, and all weeds should be removed carefully.

Sowings

Carrots are an excellent winter vegetable and the main crop may be sown this month. Recommended varieties are Chantenay and Manchester Table.

Beans: Both climbing and dwarf can still be sown in districts north of Marlborough. Suitable varieties are: Dwarf: The Prince and Canadian Wonder. Climber: Fardenlosa and Market Wonder.

Swedes are usually preferred as a winter vegetable and can be sown in all districts. Laing's Garden and Superlative are favoured varieties.

Parsnips require a long growing season, and a late sowing should be made without delay. For northern districts Hollow Crown is a suitable variety; but the only type likely to grow to a usable size in southern districts, if sown now, is a stump-rooted variety such as Oxheart.

Celery may be sown for transplanting later. Golden Self-blanching and Solid White are good varieties.

Plantings

Tomatoes: For late crop in all districts staked varieties such as Potentate, Carters Sunrise, and Moneymaker may be planted out.

Celery may be planted in well-prepared and well-manured beds. Good varieties are Golden Self-blanching and Solid White.

Leeks: Seed sown in beds in September should be ready for planting out in December or January.

Winter greens: December, January, and February are the preferred months for planting winter green crops. In the North Island, because of milder conditions, the planting period can be extended to April or even later for some varieties.

The principal winter green crops and recommended varieties are:—

Cabbage: Northland and Auckland: Golden Acre and Henderson's Succession. Other districts: Savoy, Drumhead, and Omega.

Kale: Dwarf Green and Tall Green.

Broccoli: Lily White, Veitches Self-protecting, and Late White.

Brussels sprouts: Fillbasket.

◆

Radio Broadcasts

RADIO broadcasts to farmers will be given during December as follows:—

1YA Auckland, 7 p.m.

2 December—"Work for the Coming Month", by G. A. Blake, Instructor in Agriculture, Department of Agriculture, Matamata.

9 December—"Lessons from the Past Year", by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland.

2ZA Palmerston North, 12.30 p.m.

7 December—"Control of Rabbits", by H. O. Mackley, Livestock Instructor, Department of Agriculture, Feilding.

14 December—"Current Work on Hill-country Pastures", by E. A. Madden, Agrostologist, Department of Agriculture, Palmerston North.

21 December—"Vegetable Plantings for Winter Harvesting", by B. P. Coleman, Horticultural Instructor, Department of Agriculture, Palmerston North.

28 December—Y.F.C. session, by I. G. Tabor.

3YA Christchurch

10 December (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

14 December (12.20 p.m.)—"To Preserve or Not to Preserve? That is the question!", by Eirene E. Unwin, Field Officer in Rural Sociology, Department of Agriculture, Christchurch.

4YZ Invercargill, 7.15 p.m.

1 December—"Short-rotation Pastures", by W. Faithful, Fields Instructor, Department of Agriculture, Invercargill.

8 December—"Marketing Wool", by W. F. Dick, Sheep and Wool Instructor, Department of Agriculture, Invercargill.

Regular Sessions

1XH Hamilton, Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (Waikato stock review).

1XN Whangarei, Mondays at 8.1 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Mondays at 7 p.m. (Auckland stock market report), Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m.

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock review), fortnightly on Tuesdays at 12.33 p.m. (Federated Farmers' session), Tuesdays at 6.55 p.m. (Frankton stock market report), Thursdays at 12.33 p.m., Thursdays at 7.15 p.m. (farm talks alternating with session for Bay of Plenty farmers), fortnightly on Fridays at 12.33 p.m. (pig council talk).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m.

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7 p.m., Wednesdays at 7.10 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Tuesdays at 8 p.m., Thursdays at 8 p.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

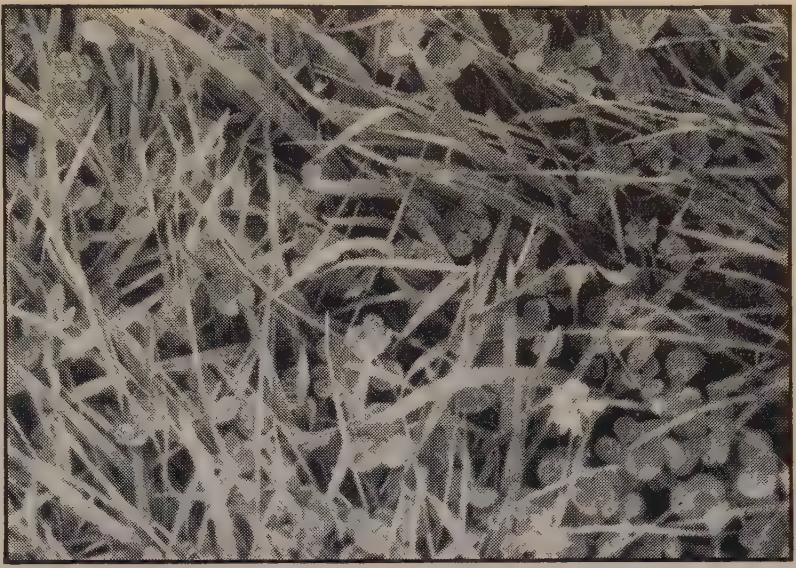
4YA Dunedin, Wednesdays at 7.20 p.m., Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m. and 7.15 p.m., Tuesdays at 7.15 p.m. (Farm and Country session, including Lorneville stock market report), Thursdays at 12.33 p.m.

◆

Establishment of Paspalum Pastures

PASPALUM (*Paspalum dilatatum*) is a grass native of sub-tropical climates demanding high temperatures for maximum growth. In the northern districts of New Zealand it is therefore a summer grass, with the bulk of production occurring between December and March. When paspalum is sown in a pasture mixture in autumn the declining soil temperatures are not conducive to germination of the seed, and even if germination does occur, the young plants must compete with the vigorous growth of ryegrass in circumstances which favour the ryegrass and are unsuitable for the paspalum. Under these conditions it is often 7 or 8 years before a good establishment of paspalum is obtained. The growth from well-managed paspalum is capable of maintaining high levels of butterfat production at a time when ryegrass is at its lowest level of production. Consequently the slow establishment of paspalum after autumn sowing has been the cause of a considerable loss of production. In this article C. M. Blick, Fields Instructor, Department of Agriculture, Warkworth, describes methods of sowing and recommends the best time to sow for good results.



A well-balanced pasture of paspalum, perennial ryegrass, and white clover established through proper management. This is a desirable pasture where paspalum thrives.

IF paspalum is sown in spring when temperatures are rising, the appearance of the seedlings coincides with the period of maximum growth and the paspalum can be firmly established in 1 or 2 years. November sowings appear to be most favourable to the plant and at this time it may be sown alone, with a crop, or in the pasture mixture.

Sowing with a Fodder Crop

Where farm management practices include the growing of spring-sown crops to supplement the summer feed supply paspalum may be mixed and sown with the crop seed. This method ensures a rapid establishment of the paspalum without any extra expense, apart from the cost of a few pounds of seed. The other components of the pasture must be sown the following autumn. Cultivation for weed control will not be possible between the sowing of the crop and its harvesting, so the period available for preparation of the autumn seed-bed is limited. It is therefore essential that the crop should be preceded by frequent cultivation over 12 months or more if weeds are likely to be a problem, and the crop should be one which will be cleared in time to allow a seed-bed to be prepared for the autumn-sown species. Both turnips and millet conform to this requirement, but millet has not always proved satisfactory, as the residue of fibrous roots left by this crop often makes subsequent tillage very difficult. Early in autumn the crop remnants should be cleaned up and harrows or discs with little cut may be used to prepare the seed-bed.

Sowing Alone

Where cropping is not a part of the farm management paspalum may be sown alone in spring, and often by this means a strong cover may be obtained by the end of February. As with all spring sowings, the summer cultivation which is so valuable for weed control is impossible, so that the spring sowing should succeed a period of stringent weed-control measures. With favourable growing conditions throughout summer the paspalum may make excessive growth and jeopardise the preparation of the seed-bed in autumn. On this account in fertile soils it may be desirable to hold back any topdressing until the pasture is sown in March or April. Preparation of the seed-bed is similar to that when paspalum is sown with a crop, and at no time should consideration for the paspalum be detrimental to the successful establishment of the ryegrass and clover.

Heavy rains which commonly occur during autumn have frequently caused severe damage on the undulating and steep country, where well-prepared seed-beds are extremely vulnerable to erosion. It is possible to hold the ground against the run-off water with spring-sown paspalum, which very quickly develops an extensive rooting system.

Weed Control in Summer Sowings

Where paspalum is to be sown alone or with crops resistant to hormone weedkillers troublesome weeds such as black nightshade may be eliminated without damage to the paspalum. The paspalum should be in the second or third tiller before being treated. The most suitable hormone preparations are the water-based salts and amines of M.C.P. and 2,4-D. In the seedling stage of growth black nightshade is eradicated with rates of 0.5lb. of acid equivalent per acre. Older plants require up to 1lb. of acid equivalent per acre. One gallon of the commercial preparations of the above materials controls 3 to 9 acres of weed infestation, the area depending on the stage of growth of the weed and the proprietary line purchased. Grass-like crops such as millet are resistant to hormone preparations; brassicas on the other hand are very susceptible. Hence black nightshade cannot be controlled in paspalum sown with brassica crops.

Quantity of Seed

Much of the paspalum seed is of poor germination (very often below 50 per cent.) and consequently it is important that farmers check the germination and adjust seeding rates accordingly. When sown alone in spring 10lb. of 50 per cent. germination seed per acre on a firm, fine seed-bed will develop into a good cover, and when sown with a crop 8lb. of seed per acre should be sown. Seeding rates of paspalum when sown with a pasture mixture in autumn have been the subject of field investigational work. Various rates up to 16lb. per acre were tried and it has been shown that there is a definite correlation between seeding rate and establishment rate in the initial stages. Sixteen pounds of seed per acre gave better establishment in the first year than 8lb. and similarly the 8lb. rate was superior to the 4lb. per acre. However, after the first year the tendency was for differences between the various rates to become progressively smaller, which was no doubt due to the reseeding of established plants. Because of the high cost of seed and the slow establishment of autumn-sown paspalum, regardless of the quantity of seed sown, the recommended rate is 4lb. per acre, and this will be supplemented after the first year by the reseeding of established plants.

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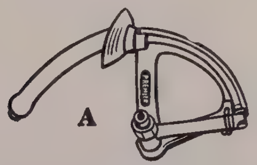

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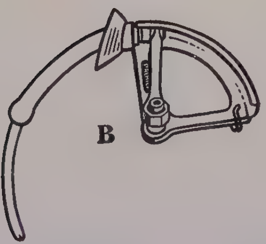

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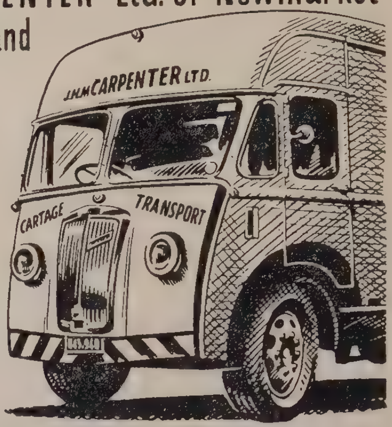

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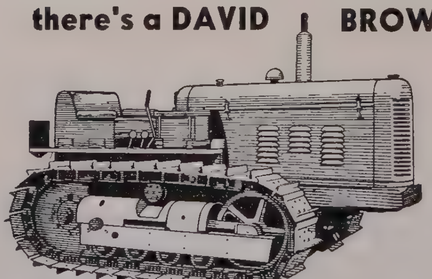

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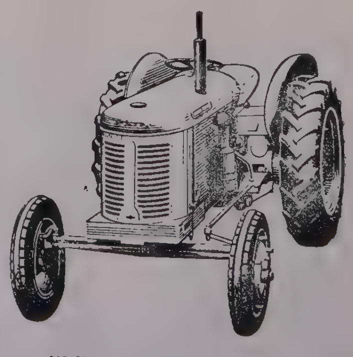

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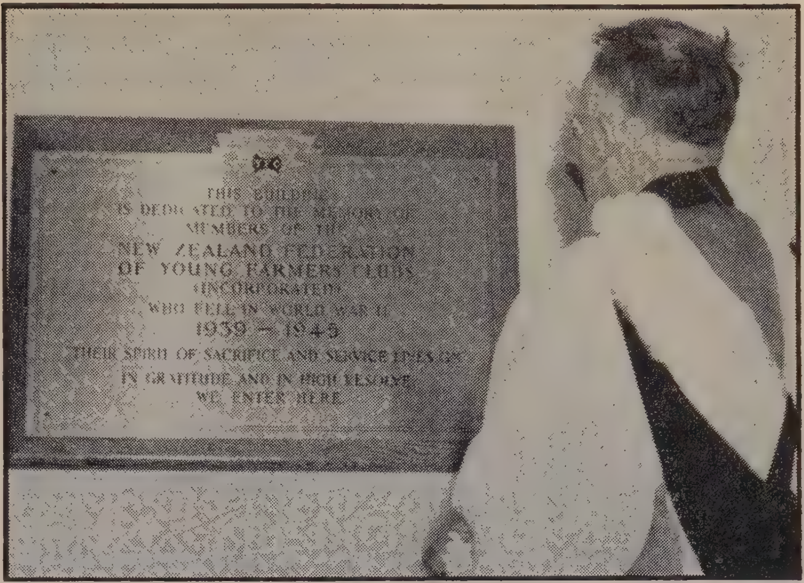
Opening of Y.F.C. War Memorial Dormitory, Massey College

DURING the Second World War over 3000 members of the New Zealand Federation of Young Farmers' Clubs (Inc.) served in the Armed Forces of the Dominion and more than 200 of them lost their lives.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WHO FELL IN WORLD WAR II
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THEIR SPIRIT OF SACRIFICE AND SERVICE LIVES ON
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Above—The Assistant Bishop of Wellington, the Rt. Rev. Bishop E. J. Rich, unveils the memorial plaque in the entrance hall of the Y.F.C. War Memorial dormitory at Massey Agricultural College. Below—A view of the new building during the opening ceremony.

WHEN the question of an appropriate, tangible memorial to these young men was first considered by the Y.F.C. movement, the form which appealed most strongly to members was the provision of facilities for further agricultural education to advance and strengthen the way of life that they and their fellow members had fought to preserve.

It was eventually decided to raise funds to provide a lecture hall at Canterbury Agricultural College, Lincoln, and a students' hostel at Massey Agricultural College, Palmerston North, as a practical means of expressing the feelings of the movement. The buildings would be dedicated to the memory of Young Farmers who lost their lives in the Services and would be a means of securing for succeeding generations of Young Farmers a fuller understanding of their calling and of gaining the intangible benefits of participation in the communal life of a university.

Last month the first part of the memorial scheme was completed with the opening of the dormitory block at Massey College by the Prime Minister, Mr. S. G. Holland. The lecture hall at Lincoln College will also be completed in the near future. Over £21,000 was raised by Young Farmers' Clubs for the memorial scheme.

Pleasing Exterior

The dormitory block at Massey College cost between £14,000 and £15,000. It will accommodate 36 Young Farmers attending Massey College short courses. It is a good example of a well-planned combination of charm and utility. The new block is on the college campus conveniently close to the dining hall. The warm brick and tile exterior blends well with its pleasantly wooded surroundings. As time passes its newness will be mellowed and it will assume the dignified appearance that characterises the permanent buildings of the college.

The students will be accommodated in 18 two-bed rooms laid out on one floor in H formation. In the centre is a common room of liberal dimensions, and there are also an entrance hall, showers, drying room, and other conveniences.

Speakers at the ceremony emphasised that the building was merely the outward visible shell of the memorial to those who gave their lives for the ideals they held dear. The true memorial of their sacrifice would be in the minds of Young Farmers who would use the hostel and return to their farms with an enriched agricultural education and a wider outlook gained through fellowship.

Stress was also laid on the Dominion's dependence on pastoral and agricultural pursuits. The University of New Zealand, of which Massey and Lincoln Colleges were parts, depended on the freedom secured by the sacrifice of the war dead to pursue thought, discuss differing views, and arrive at true conclusions. Thus the university owed a great debt of gratitude to those who served and died.

Another aspect described during the opening ceremony was the need for Young Farmers to attend short courses to learn about the latest results of scientific research. At the same time, it was stated, there was a good deal of hard work to be done in New Zealand, and the need to do this work and at the same time keep the courses filled was a challenge that the Y.F.C. movement had to accept.

The swift growth of the Y.F.C. movement from its small beginnings in Otago 20 years ago to become a prominent Dominion organisation was also described. It was recalled that 20 years ago the first clubs had been founded in Otago by Mr. J. E. Davies, Instructor in Agriculture, under the guidance of Mr. R. B. Tennent, then Fields Superintendent, Dunedin, and now Assistant Director-General of Agriculture. Successive Governments have given strong support to the movement both financially and through the services of officers of the Department of Agriculture.

At the opening ceremony Mr. W. V. Dyer, chairman of Massey College Board of Governors, presided. The official party included the Prime Minister and Mrs. Holland; the Dominion president of the Y.F.C. federation, Mr. O. J. Osborne; Mr. Gordon Spratt, a past chairman of the Auckland Council of the Y.F.C. movement and one of the originators of the memorial scheme; the Assistant Director-General of Agriculture, Mr. R. B. Tennent; the Chancellor of the University of New Zealand, Sir David Smith; the principal of the college, Professor G. S. Peren; the Assistant Bishop of Wellington, the Rt. Rev. Bishop E. J. Rich, who dedicated the building; and the member of Parliament for the district, Mr. W. Blair Tennent.

Photographs by Bruce Watt.

The Law Governing the Sale of Fertilisers

Contributed by the Extension Division

THE main enactments concerned with fertilizers are the Fertilizers Act 1927, and regulations made thereunder, and the Fertilizers Amendment Act 1948. They do not apply to sales of lots of less than 5cwt.

THE broad purport of these enactments may be outlined thus: Every vendor who sells fertilizers in lots of at least 5cwt. is required to register his name and address with the Director-General of Agriculture. Except for special mixtures, he may sell only under brands, each of which must be registered. When registering each brand he must deposit a statement with the Director-General declaring the contents and composition of the fertilizer carrying that brand. With each sale he must give the purchaser an invoice certificate similarly declaring the content and composition of the fertilizer sold and he must show the brand on each package or bag.

The cardinal point to notice about the legislation is that it does not lay down any standards of quality or content. A fertilizer such as superphosphate, basic slag, or blood and bone is not required to have any particular content; it is required to contain merely what the vendor declares it to contain.

This points to the need for farmers to see that they get invoice certificates with the fertilizers they buy and to study them to see what they are getting for their money. The invoice certificate is virtually the farmers' only protection.

Particulars on Statement

The particulars required to be declared on the statement deposited with the Director-General on registration of a brand and also on the invoice certificate on sale fall into two classes, the fertilizing ingredients and the fillers. The fertilizing ingredients are those which contain nitrogen (N), phosphoric acid (P_2O_5), or potash (K_2O), and the vendor must state whether the first two are present in a water-soluble form or not. All other materials added are regarded as "fillers or diluents", except materials present through a chemical process as distinct from mixing by hand or mechanically. Thus, for example, where a fertilizer is made up of equal parts of superphosphate and lime the lime is a "filler", even though in appropriate cases its presence may be beneficial, and all the superphosphate is a "fertilizing ingredient" notwithstanding that only about 20 per cent. of its content comprises phosphoric acid. The other constituents, such as calcium sulphate, etc., are there through the chemical process of treating rock phosphate with sulphuric acid.

The deposited statement and the invoice certificate are required to show the following (condensed):—

The Brand	Nitrogen		Phosphoric acid		Potash	Composition	
	Water-sol.	Water-insol.	Water-sol.	Water-insol.	Water-sol.	Fertilizing ingredients	Fillers or diluents

The nature and percentage of both fertilizing ingredients and fillers must be shown. The fineness of grinding of basic slag and ground rock phosphate must be stated.

Various sections of the enactments provide for the appointment of analysts and inspectors; their power of entry to take samples; how samples are to be taken; analysis of samples and provision of certificates of analysis; independent anlyses in certain cases; the publication of results of analyses and tests; the furnishing of statistical information, etc.; sales of fertilizers in bulk under certain conditions; vendors' having to send samples to the analyst under certain circumstances; sampling and analysis at buyer's request; and various other machinery provisions.

Special Mixtures

One aspect of the law that is assuming increased importance of late is that dealing with special mixtures. A buyer may desire a mixture to be made up to his own specifications. In this event the legal requirements can be stated broadly thus:—

(a) The purchaser must give a written order to the vendor prescribing the composition of the mixture.

(b) The vendor must mark each package "Special Mixture".

(c) The vendor must furnish an invoice certificate in the usual manner, but "Special Mixture" is substituted for the name of the brand ordinarily required on the certificate.

(d) The vendor must retain the purchaser's written instructions for 6 months.

As a routine function the Department of Agriculture takes samples of all registered fertilizers at irregular intervals and analyses them. The inspector is required to take two copies of the invoice certificate covering the sample. On the few occasions when the analyst's certificate shows contents materially at variance with those declared on the deposited statement and the invoice certificate, the normal course is for the vendor to be warned. In this event the vendor invariably either improves his product or alters the particulars shown on the statement and certificates. The follow-up analysis rarely shows a material discrepancy.

Definition of Fertilizer

One section of the main Act prohibits the use of the word "fertilizer" in connection with the sale of any substance unless it is a fertilizer as defined by the Act, for which a brand may be registered. The definition of a fertilizer reads as follows:—

"'Fertilizer' means any substance used for enriching the soil and in a state suitable and intended for application to the land, and which contains in appreciable amount nitrogen, phosphoric acid, or potash; it does not include lime, nor stable manure or any crude refuse which has not been dried or so treated that decomposition will be arrested until applied to the land."

The Department receives a number of requests for action because of the physical condition of fertilizer. All that the Department can do is to ask the vendor to try to improve the material; the law on fertilizers does not require, for example, that superphosphate must be in good, free-running condition on delivery. The unavoidable fact is that many fertilizers are hygroscopic; they absorb moisture from the air and are affected by such conditions as heat, humidity, and pressure during storage. The art of making good superphosphate lies mainly in adjusting the acid strength to meet changes in the content of the raw phosphate rock. The organic material and the water in the raw rock are by no means uniform. The manufacturers try to maintain a uniformly good product, but failures occur occasionally. If the buyer finds the material unusable, the manufacturer will usually replace it, unless he believes that the deterioration is due to unsatisfactory storage conditions on the farm.

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The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Pig Competitions in 1953

CARCASS competitions serve to maintain the interest of the keen pig producer in the breeding, feeding, and management of his pigs. Those sections of competitions which provide for recording of farm performance can be of real value to the breeder in providing fuller information on which to base selection of his breeding animals. In this article A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington, discusses some of the lessons to be learnt from the 1953 competitions.

["*New Zealand Herald*"

D. M. Smith, Research Officer, Department of Agriculture's Animal Research Station, Ruakura, appreciates the qualities of the teams entered by the Station, which, besides taking first place in the Waikato section for both porkers and baconers, secured highest points for combined teams in the North Island competition.

THOUGH it is accepted that production records, if they are to be capable of interpretation in terms of breed improvement, must be performed under uniform testing station conditions, it is still true that, within his own herd, the breeder can use his own records of performance to assist in his selection of breeding stock. He would be helped in selecting an animal from another breeder by knowing the performance of all the animals in the vender's herd.

He would, of course, have to rely much more on his own judgment of how the animal he selects will do in his own herd than if he had had the assistance of testing station records, but it would mean that he could select the best animal offered and not just "a pig in a poke" on the basis of productive performance. Even with progeny testing under the best controlled conditions the individual breeder will still have to test out the animal selected on its suitability for "nicking in" with his own herd and be prepared to cull if it does not come up to expectations.

Recording on the Farm

The conclusion which is inescapable from these considerations is that if breeders of pedigree pigs regularly recorded the following facts about their litters, a worthwhile step forward in pig improvement would result:—

Date of birth.

Number of piglets born and reared.

Notes of any faults of an inherited nature.

Total litter weights at 3 weeks and 8 weeks.

Individual weights of pigs in the litter at 8 and 20 weeks.

Carcass measurements on an average sample of the progeny of each sow and each mating as well as of all culls fattened—carcasses to be scored on a standard system and this score, together with information on economy of gain (or failing this, growth-rate of the animals) to be open for inspection by intending buyers.

Breeding based on the registration of pedigrees must be the foundation of pig improvement whatever system of commercial breeding is superimposed on it. The important thing is that the registered pedigree should be worth more than the paper it is written on, but unless it is backed by information on the breeding performance of all animals, through progeny records, such registration can be virtually a waste of time.

So far the first two of the facts listed above as being necessary are recorded. A definite move toward an improvement scheme incorporating the remaining points should be given urgent consideration by the New Zealand Pig Breeders' Association.

Competitions Help

In the meantime the carcass competitions which are held annually provide a means whereby breeders can check the performance of their stock and, if it is good enough, receive a certain amount of credit and advertisement for their initiative. Progressive breeders who are taking part in these competitions prove to themselves and to others by this means which of their breeding stock are leaving the best progeny. More breeders could with advantage to themselves and the industry generally take part in these competitions.

Recorded Class

As in the past the Canterbury District Pig Council has included a recorded class in its annual carcass competition. Here an entry comprises

TABLE 1—POINTS SCORED BY ENTRIES IN RECORDED CLASS IN CANTERBURY DISTRICT PIG COUNCIL BACONER COMPETITION

Entrant	Number weaned	Points	Litter weight 8 weeks	Points	Liveweight gain per day	Points	Total farm points	Carcass points	Grand total	Place
			lb.		lb					
Possible points ..	10 +	10	400 +	20		25	55	100	155	
J. H. Pitman ..	12	10	467	20	.78	25	55	79	134	1
F. D. Higgins ..	12	10	468	20	.66	8	38	76	114	2
F. D. Higgins ..	12	10	468	20	.61	4	34	78	112	3 =
D. J. Tomlinson ..	9	8	437	20	.68	19	47	65	112	3 =
J. H. Pitman ..	12	10	467	20	.82	25	55	52	107	
Hodgkinson and Win	10	10	436	20	.77	25	55	52	107	
T. E. Rowlands ..	8	6	280	8	.70	15	29	73	102	
T. E. Rowlands ..	8	6	280	8	.71	16	30	71	101	
Williams Bros. ..	9	8	293	9	.64	6	23	66	89	
Williams Bros. ..	9	8	293	9	.68	12	29	57	86	

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[*Sparrow*

Mr. F. A. Buckley, Gisborne, with his team of baconers which won the North Island baconer carcass championship.

a single pig from a recorded litter. Recordings carried out under Department of Agriculture Official Sow Recording, by the local pig council supervisor or herd tester, or, where none of these checks is practicable, by the farmer himself (subject to a check of the particulars recorded by two of his neighbours) are all recognised for the competition. There is virtually no bar, therefore, to anyone who is interested entering in the section. It is surprising and disappointing, however, that as in the previous year there were only 10 entries.

The system of points for average daily liveweight gain used in this competition has been changed this year to accord with that used in the North Island competition. This takes account of the normal growth curve. Thus the heavier the carcass is the greater is the average daily gain required for a given points score.

In the general section of the Canterbury District Pig Council competition, judged on carcass quality only, there were 137 entries, of which just over a third reached merit standard, that is, scored 70 per cent. of the possible carcass points.

The winner of this section was Mr. R. Simpson, Wakefield, with another Wakefield farmer, Mr. B. A. Bryant, only 1 point behind, and Mr. J. J. Hughey, Rangiora, third. The continued success of farmers in the Nelson district in this competition from the time they first entered centres interest in the methods of breeding, feeding, and management of these producers in a small pocket of the area from which pigs are drawn for the competition.

Here, as in many similar instances, the foundation of success appears to be in the quality of the Large White breeding stock used. It is unfortunate that the stock which appear to have had the greatest influence have not been registered. Producers working with this good foundation have their interest stimulated in the finer details of feeding and management.

North Island Competition

In carcass competitions where no notice is taken of farm performance the palm may go to an entry which was not produced at a profit. It would obviously bring such competitions into disrepute if strains of stock secured unwarranted commendation in this way.

A move in the right direction is a practical compromise between complete litter recording on the one hand and no information on farm performance on the other by coupling growth-rate and carcass quality in a composite total score. In the Tomoana Porker and Baconer Competition, which covers the whole of the North Island, each entry comprises a team of 4 pigs. Each carcass is allotted points individually according to the national judging standards, the maximum being 100 points. In addition points are awarded to the team for uniformity of weight (10 points) and of conformation (10 points), making a total of 420 carcass points for the team.

The growth-rate section of this competition caters for entries from producers who keep a record of the

TABLE 2—NORTH ISLAND GROWTH-RATE SECTION, 1953

Works	Porkers	Baconers	Total	Total teams in competition
Tomoana	12	12	24	164
Patea	5	8	13	257
Westfield	20	6	26	699
Total	37	26	63	1,120
No. of teams scoring 70 per cent. of total points ..	22	7	29	
Per cent. of teams in section	60	27	46	

TABLE 3—TEAMS SCORING 70 PER CENT. OR MORE OF TOTAL POINTS IN GROWTH-RATE SECTION, 1953: PORKERS

Name and address	Breeding	Date of birth	Average deadweight lb.	Age at slaughter days	Standard age for weight days	Points for Growth-rate (100)	Points for Carcass (420)	Points for Total (520)
A. J. Evered, Whakatane	L.W.	22/1/53	74.75	118	116	95	352	437
A. E. Wood, Whakatane	L.W.	5/12/52	83.5	130	125	89	341	430
H. and N. Myers, Mauriceville ..	L.W. x	24/1/53	76.75	110	118	100	322	422
R. J. Bent, Otorohanga	L.W. x (Duroc x)	26/12/52	81.5	117	123	100	317	417
L. T. R. Nicholson, Putaruru ..	L.W. x B.	19/11/52	67.5	110	109	93	323	416
H. A. and A. D. Aitken, Waverley	L.W. x B.	11/11/52	77	126	118	85	330	415
H. A. and A. D. Aitken, Waverley	L.W. x B.	27/10/52	79	129	120	82	329	411
Fowell Bros., Howick	B. x L.W.	18/12/52	82.75	123	124	100	311	411
Fowell Bros., Howick	B. x L.W.	25/11/52	86.75	135	128	87	321	408
E. Russell, Waiuku	B.	15/1/53	81.25	123	122	97	309	406
H. and N. Myers, Mauriceville ..	L.W. x	13/1/53	76	121	117	93	312	405
F. J. Barrett, Frankton	L.W. x	26/10/52	84	121	125	100	304	404
*R. A. Julian, Kakaramea	L.W.	21/12/52	78	134	119	70	328	398
W. Twyman, Ngakuru	L.W.	20/1/53	72	98	113	100	291	391
*R. A. Julian, Kakaramea	L.W.	20/1/53	72	126	113	80	309	389
J. W. Wilson, Norsewood	L.W. x (L.W. x L.B.)	9/2/53	82.25	121	123	96	292	388
J. F. Bremner, Pahiatua	L.W.	4/1/53	76.25	128	117	78	305	383
S. Williamson, Otorohanga ..	L.W. x B.	27/9/52	69	123	110	69	313	382
J. A. Walsh, Te Awamutu ..	T. x B.	24/12/52	68	120	109	74	308	382
E. Russell, Waiuku	L.W. x B.	15/1/53	68.25	123	109	67	300	367
C. Stephens, Galatea	L.W.	30/11/52	84	148	125	53	312	365
Ian Billington, Hukanui	L.W. x T.	20/1/53	76	107	117	100	265	365

* Whey feeder

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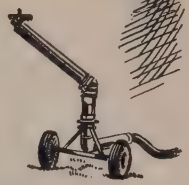

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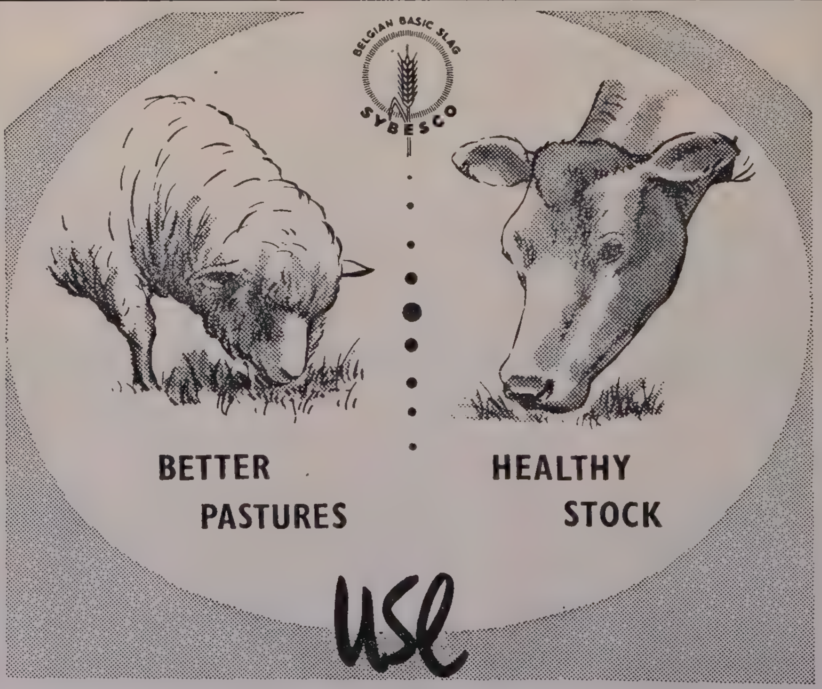

BASIC SLAG

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[*"Weekly News"* (*left*) *and Sparrow* (*right*)

Left—Messrs. G. W. Hickey and sons with their porkers which scored highest carcass points of any team in the North Island competition. Right—Mr. J. G. Fowell, Howick, whose baconers took first place in the Auckland district section and were also placed second in the baconer growth-rate competition for the North Island.

date of birth of their litters and have these certified for the pigs entered in the competition. A farrowing record provided by a simple shed sheet and an earmark identification are the only "extras" in this section of the competition, so no one who is interested need be ruled out. The rules of the competition specify how certification of the date of birth should be obtained.

Table 2 sets out the number of teams competing in this section of the competition this year together with percentage of these which reached merit standard (70 per cent. of possible points).

Entries were below those of the previous year, but the percentage of merit teams increased slightly both in porker and baconer sections. These teams, which secured aggregate points of 364 or more (70 per cent. of the possible 520 points) are listed in Tables 3 and 4.

Porkers

Table 3 contains 22 porker teams. The data in this table show that rapid growth and a high level of carcass quality in porkers are closely associated. It is, of course, essential to have inherently good carcass conformation bred into the animals, but, given this, rapid growth is desirable from every aspect. Rapid growth in this stage of the pig's life promotes the natural tendency for the relatively early development of muscle (lean meat) in the carcass.

Baconers

Pigs from the porker stage on to baconer weight tend to lay down a higher proportion of fat than during earlier growth and it is necessary with all but the specialised baconer type to restrict feeding, and therefore growth-rate, over the porker to baconer period. Most pigs in New Zealand, of whatever breed, are of an intermediate type dictated by the necessity for turning them off either as porkers or baconers, depending on the food supply.

It is not surprising, therefore, that in the baconer section the high aggregates of the placed teams were gained by concentrating on the production of quality carcasses even though this meant sacrificing points for growth-rate. Restriction of feeding and reduction of growth-rate between the porker and baconer stages do not adversely affect profit, because of the avoidance of the production of excess fat, which is expensive to produce but sells cheaply.

However, producers should not regard as impossible the securing of the ideal combination of growth-rate and carcass quality in baconers. With porkers as with pigs bred for baconer

TABLE 5—TEAMS SCORING 80 PER CENT. OR MORE OF POSSIBLE POINTS (CARCASS ONLY)

Entrant	Breeding	Points
PORKERS		
G. W. Hickey and Son, Waiuku	L.W.	350
T. W. Sewell, Patutahi	L.W. x (T. x B.)	347
J. B. Topp, Ormond	L.W.	343
A. J. Evered, Whakatane	L.W.	342
N. A. Fraser, Kawakawa	L.W.	342
Ruakura Animal Research Station	B. x L.W.	341
A. E. Wood, Whakatane	L.W.	341
G. W. Hickey and Son, Waiuku	L.W.	340
F. H. Jackson and Son, Inglewood	L.W. x B.	338
B. M. Sewell, Patutahi	L.W. x (T. x B.)	337
W. J. Atkins,	L.W. x (T. x B.)	336
BACONERS		
F. A. Buckley, Gisborne	T. x	349
B. E. Keiller, Palmerston North	L.W.	348
Fowell Bros., Howick	B. x L.W.	340
*N. S. Barkla, Meremere	L.W.	340
COMBINED		
Ruakura Animal Research Station	B. x L.W.	674
T. W. Sewell	L.W. x (T. x B.)	672

* Whey feeder

TABLE 4—TEAMS SCORING 70 PER CENT. OR MORE OF TOTAL POINTS IN GROWTH-RATE SECTION, 1953: BACONERS

Name and address	Breeding	Date of birth	Average deadweight lb.	Age at slaughter days	Standard age for weight days	Points for		
						Growth-rate (100)	Carcass (420)	Total (520)
G. P. Eising, Mangahao	L.W. x (Duroc x T.)	4/9/52	148.25	208	188	73	325	398
Fowell Bros., Howick	B. x L.W.	6/6/52	143.75	215	185	55	340	395
J. Wright, Waipuku, Inglewood	B. x L.W.	26/7/52	152.25	217	192	64	330	394
H. A. and A. D. Aitken, Waverley	L.W. x B.	23/8/52	141.75	192	183	86	306	392
P. Darby, Bombay	L.W. x	27/5/52	154.25	217	194	67	319	386
H. A. and A. D. Aitken, Waverley	L.W. x B.	30/9/52	144	195	185	84	294	378
W. B Hill, Waipu	T. x B.	24/7/52	148.5	186	189	100	273	373

production it should be possible to maintain growth-rate up to the standard required in the competition without detrimentally affecting carcass quality. The key to good carcass quality, provided pigs have been bred on correct lines, is rapid early growth to build up the basis of lean meat.

In 1950, when a growth-rate section was first included in the North Island competition, a team entered by the Department of Agriculture's Animal Research Station, Ruakura, had an aggregate of 329 carcass points and .88lb. carcass gain per day. This gain would have scored full points for growth-rate on the standards now being used.

Pigs in Danish testing stations regularly achieve this rate of growth. In fact, unless they do so and at the same time secure a sufficient standard of carcass quality, they fail to secure approval for their parents as pedigree animals.

An example of very efficient combination of growth-rate and carcass quality is available from a recent National Litter Test in England. There the winning team dressed out at between 142 and 147lb. at 141 days, at the same time scoring 850 points out of a possible 1000 for carcass quality.

Table 4 gives particulars of the 7 teams in this year's baconer competition which attained merit standard. It is hoped that more teams will be entered in next year's event and that some of those who scored so well in the straight-out carcass quality competition and others will be encouraged to compete in the growth-rate section. A combination of a carcass score for the team of 340 to 350 points and a growth-rate giving 145 to 150lb. carcasses in 180 to 190 days is the target.

Table 5 gives particulars of the teams which scored 80 per cent. or more of the possible points for carcass and team uniformity.

Low-temperature Storage of Bull Semen

By J. P. JAMES, Senior Veterinary Research Officer, and A. A. FYVIE, Technician, both of the Department of Agriculture's Animal Research Station, Ruakura

LOW-TEMPERATURE or deep-freeze storage of bull semen is the most promising technical advance yet made in the artificial breeding of dairy cows. The first cow which has been successfully bred by this method in New Zealand calved a normal heifer calf in September, less than a year after trials with the new technique in New Zealand had been started. The method requires the storage of semen at minus 79 degrees C. (minus 110 degrees F.), which is twice as cold as it would be at the South Pole or on the top of Mount Everest.

A GROUP of cows has now been successfully bred with semen stored in deep-freeze for 2 months, and trials are in progress with material up to 6 months old. Reports from English workers claim very good results after 9 months. The longest time that good results can be obtained with ordinary refrigerator storage is 3 days.

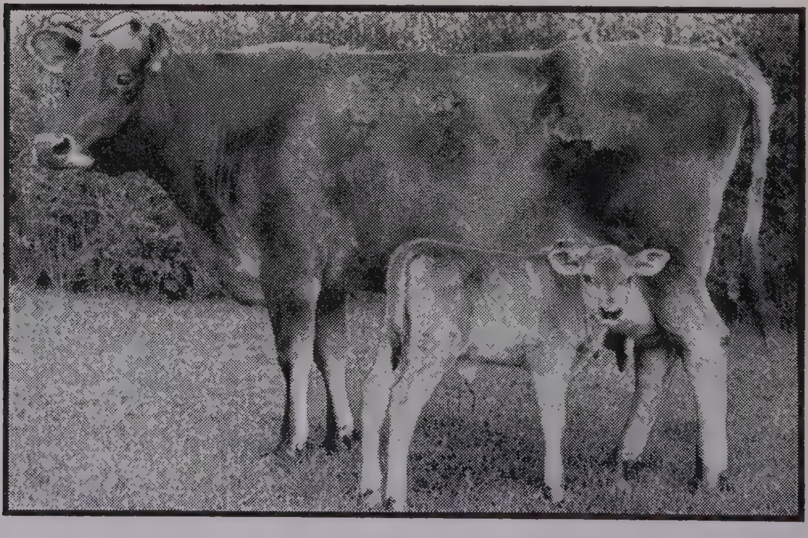
If this new technique can be used successfully on a large scale, it will be of immense value in extending artificial breeding work in New Zealand. The advantages here will probably be greater than in any other dairying country, because limitations placed on outstanding bulls due to the restricted breeding season could be largely overcome. Instead of the present maximum of 4000 cows per bull, 20,000 each year should not be too high a figure to expect if deep-freeze storage can be commercialised. If a 5-year life is assumed for a bull in an artificial breeding centre, 100,000 cows could be mated during his lifetime.

A second important advantage is that the setting up of a semen bank would enable pedigree breeders to choose any bull in an A.I. centre to breed to selected cows. This is impossible in most cases at present.

A third point is that low-temperature storage would make importation of semen a more practical procedure than was possible by older methods. If suitable arrangements can be made for refilling containers with dry ice en route, the semen once landed in New Zealand could be stored until suitable cows were ready for breeding. At present only those cows which come in season within a day or so of the arrival of any batch of semen can be bred to it. International trade in stud stock could thus take on a very different pattern.

Precautions against the introduction of new cattle diseases can be followed as strictly as before, because if necessary a batch of semen can be held in quarantine until the bull in question has passed the incubation period of any disease.

There are at present some noticeable disadvantages in deep-freeze techniques. One is that a great deal more labour and expense are necessary in processing the material for storage, and secondly, more preparation is needed when the frozen material is used on farms. It is expected that when more experience has been gained these difficulties, which even now are small compared with the outstanding advantages, will be overcome. Lastly, the greatly increased potential coverage from any one bull stresses the need to exclude any possible genetic defects. The harm done in transmitting such a character as say under-shot jaws over an enormous population of cows would undo most of the good achieved from the highest selection on the production side. This difficulty will have to be overcome by sire-daughter test matings before bulls can be used on such an extensive scale.



New Zealand's first deep-freeze calf and her dam.

Large-scale Field Experiment

So far the experimental work at Ruakura on the deep-freezing method has been exploratory only. Progress, however, has been sufficiently good and preliminary conception results on a small sample during the autumn mating period have been sufficiently high to justify a large-scale field experiment during the coming breeding season. Arrangements have been completed to mate in the next 2 months 1000 cows with material handled by the new method. Some of this material will have been held under deep-freeze conditions for up to several months. Sufficient material has also been processed to enable a large-scale experiment next breeding season with material which by that time will be 1 year old. In addition to testing practicability of the method under field conditions it is hoped that the experience gained will assist materially in ironing out the many practical snags which inevitably arise when a technique which proves eminently satisfactory under laboratory conditions is taken into the field.

Oversowing Lucerne with Short-rotation Ryegrass

By C. R. TAYLOR, Fields Instructor, Department of Agriculture, Rotorua

IT has long been a fairly common practice to thicken up old lucerne stands for silage production by autumn cultivation and the drilling in of 2 bushels of Algerian oats. Farmers in the Rotorua district have recently been successfully practising autumn cultivation followed by the sowing of short-rotation ryegrass.

THE experience of Rotorua lucerne growers over the last 4 or 5 years has demonstrated quite clearly the comparative ease with which short-rotation ryegrass may be established in lucerne stands. After the last cut for the season has been taken, usually by late March or early April, the stand is thoroughly harrowed from two or three different directions, preferably during dry weather, to kill as many weeds as possible and then oversown with 12 to 15lb. of short-rotation ryegrass mixed with 3cwt. of superphosphate or its equivalent. A further light harrowing to cover the seed is given and sometimes, if the soil is very light and rather dry at the time, a rolling will also be given. This latter practice is, however, by no means common. If a potash deficiency is known to exist, it is customary to apply from ¾ to 1cwt. of muriate of potash in addition to the phosphate. The area is then closed up until the following spring, when a heavy cut of short-rotation ryegrass plus some lucerne is generally available for silage about the first week in November. The second cut, which usually consists of about half short-rotation ryegrass and half lucerne, is ready 5 or 6 weeks later. The third cut in February comprises approximately 90 per cent. lucerne and 10 per cent. short-rotation ryegrass, and the fourth and last cut is almost entirely lucerne.

Advantages of Association

In the pumice country of the Rotorua district lucerne and short-rotation ryegrass associate well; the short-rotation ryegrass shelters the crowns of the lucerne over its dormant period and thus prevents them from frosting badly and it helps materially to control weed growth at this time when weeds would normally predominate. In return, in summer lucerne offers the short-rotation ryegrass the benefit of a certain amount of shade, which reduces soil moisture evaporation and provides cool rooting conditions, and, being a legume, it also

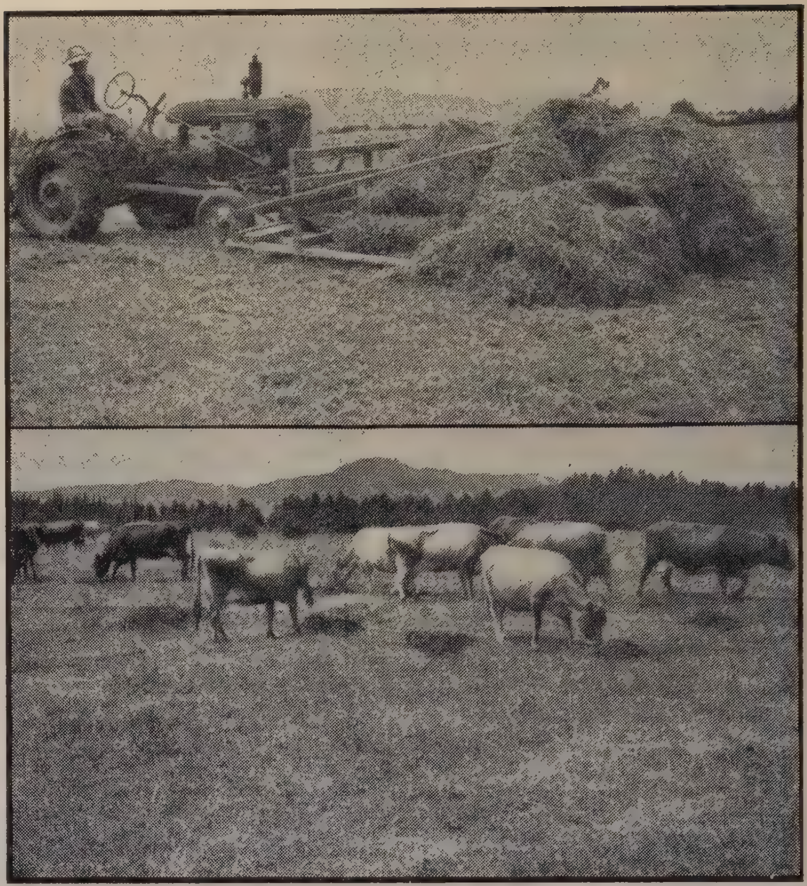
Right: Top—Harrowing a lucerne stand preparatory to oversowing it with short-rotation ryegrass. Upper middle—The same paddock after harrowing and oversowing had been completed. Lower middle—The first cut of the new season after oversowing of a lucerne stand with short-rotation ryegrass. The ryegrass growth is dominant and weed growth, which would otherwise be prolific, is absent. Bottom—The same stand about 3 months later. The oversown short-rotation ryegrass has almost entirely given way to the lucerne.

supplies an appreciable amount of nitrogen, an element all varieties of ryegrass demand in large quantities for normal development.

Some growers have used up to 20lb. of ryegrass as an initial sowing and smaller quantities, say, 5 to 10lb., in subsequent years, depending on the fertility of the land and how much short-rotation ryegrass persists after the first season. As a general experience it has been found that approximately 50 per cent. of the short-rotation ryegrass survives the first year and carries on into the second season to produce quite a heavy yield of vigorous growing herbage. In such circumstances it is often unnecessary to oversow every autumn, but only when it becomes evident that the number of ryegrass plants is insufficient to produce the desired effect. Judgment is therefore necessary to determine the exact treatment to apply, but there is no difficulty about this, provided reasonable care is taken to see that the short-rotation ryegrass never becomes so thick that it temporarily smothers the lucerne. However, in the pumice country there is very little danger of this happening.

The practice of oversowing lucerne stands with short-rotation ryegrass may be summarised as follows:—

1. It increases considerably the productivity of any area devoted only to lucerne.
2. It aids in weed control over the winter, when lucerne is normally dormant.
3. It provides a tremendous yield of palatable and nutritious green material for silage as first and second cuts.
4. It makes lucerne silage more palatable to stock.
5. It is easily and cheaply accomplished.
6. Lucerne and short-rotation ryegrass associate well.



Upper—Sweeping a strong growth of lucerne and short-rotation ryegrass into a silage pit. The second cut of the season, the green material is half lucerne and half short-rotation ryegrass. Lower—Cattle are very fond of silage made from lucerne and short-rotation ryegrass and milk well on it during a dry summer or autumn.

Increasing Use of Potash in Recent Years

A RECENT summary prepared by the Extension Division of the Department of Agriculture shows that the use of potash in New Zealand has increased by about 300 per cent. in the last 4 years, whereas phosphatic fertiliser usage has remained more or less static.

The table below shows the change in emphasis from lower grade salts (kainit and 30 per cent. potash salts), which formed the bulk of pre-war imports, to the higher grades (muriate and sulphate), which have comprised almost the whole of post-war importations.

Pre-war imports reached a high level, but, because of the change in the type of potassic fertiliser imported, its fertilising value in recent years has been considerably higher relative to the tonnage handled, with consequent saving in freight and other handling costs.

Potash deficiencies are becoming much more marked in many parts of the country, especially in soils derived from volcanic ash, on which some of the most intensive dairying areas are situated. It is therefore certain that potassic topdressing must eventually become a more widely established feature of New Zealand farming practice.

Although at the present rate of usage £750,000 is being spent on potassic fertilisers, the indications are that this annual cost will increase, but the expenditure thus incurred will pay its own dividend.

IMPORTS OF POTASSIC FERTILISERS IN CALENDAR YEARS 1935-1952 AND TOTAL K_2O (POTASH) CONTENT

Period	Kainit tons	Potash salts tons	Sulphate of potash tons	Muriate of potash tons	Total K_2O content tons
1935-39 (5-year average)	655	11,874	1,000	197	4,252
1940-44 (5-year average)	—	1,452	362	1,279	1,377
1945-49 (5-year average)	—	14	822	4,916	3,348
1950	—	130	1,869	10,599	7,295
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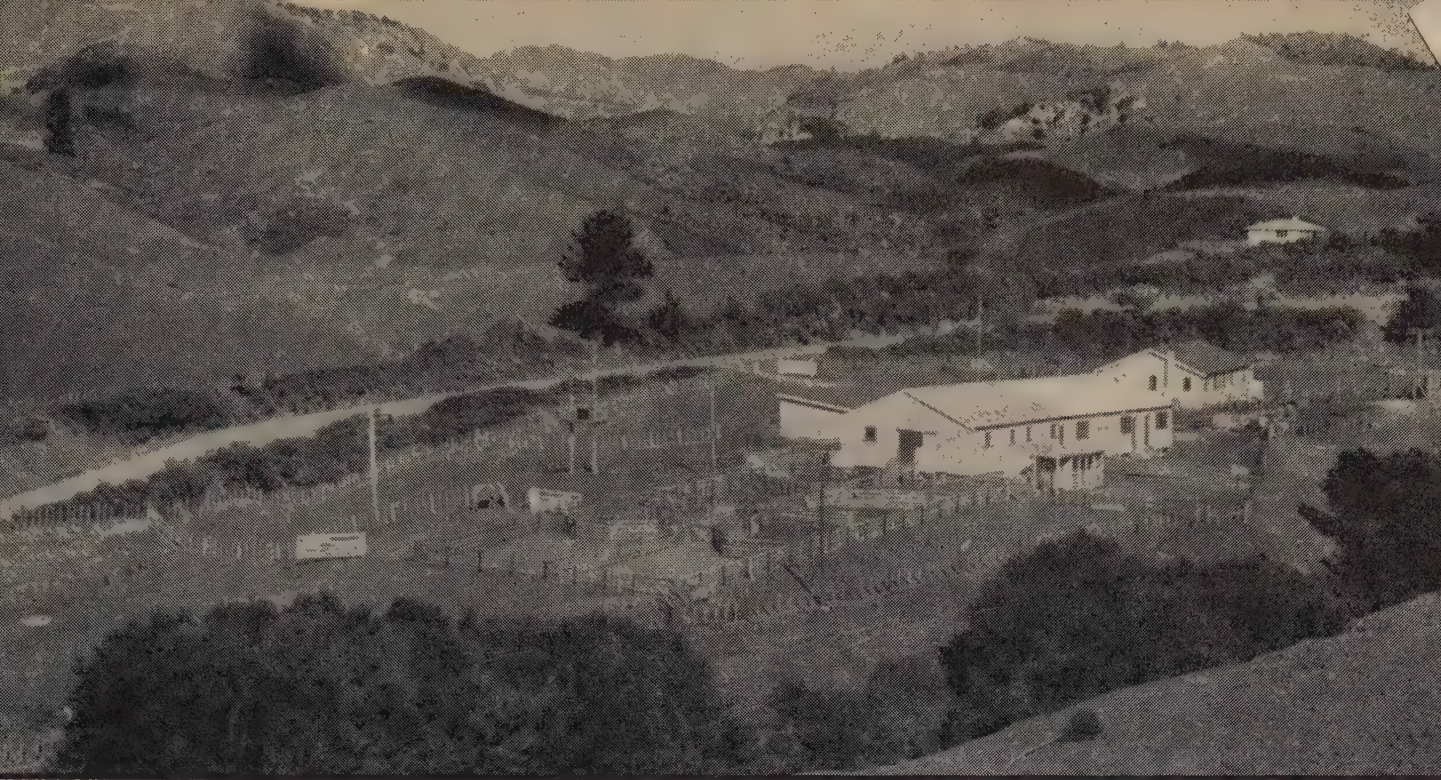

HEADING PHOTOGRAPH: Laboratories, woolshed, and yards on the Ruakura Hill Station.

The Work of the Ruakura Hill Station

THE Ruakura Hill Station, as part of the Ruakura Animal Research Station of the Department of Agriculture, provides a realistic environment for the investigation of hill country sheep and cattle production problems. A brief over-all picture of the new Station and its work is presented in this article, which has been derived from an address on the subject given by E. A. Clarke, Senior Research Officer-in-Charge, to the fifth annual Ruakura Farmers' Conference Week at Hamilton.

IN the course of developments in animal research over the past 15 years it has become evident that there is much to be learnt about the reactions of farm animals to the hill country environment as distinct from the lowland country. Many issues have been raised and many questions asked about livestock by occupiers of the millions of acres of New Zealand's hill country that cannot be answered from work conducted on the better-class lands. Since the most efficient exploitation of the more productive lowlands is so closely tied to a healthy livestock industry in the hills, the need for parallel researches into hill country livestock is of obvious importance.

Selection of Area

It was essential that the hill country area selected to provide a realistic environment for the investigation of hill country sheep and cattle production problems should be typical of much of the farmable hills of the North Island and be reasonably adjacent to Ruakura. These objectives were realised in 1949 by the purchase of 1328 acres on the Raglan hills, 15 miles by road from Ruakura, and typical of several million acres of similar North Island country. This requirement of proximity to Ruakura was of basic importance. The facilities necessary for modern research are expensive and their duplication unwise unless unavoidable. Competent staff with the necessary technical qualifications, experience, and enthusiasm for research are in short supply. Obviously much was to be gained by a Hill Station which could use the main facilities of the central Station and which could benefit from association with the specialist group of workers located there.

The property selected also permits parallel studies to go on in each locality. It facilitates the economic and normal interchange of livestock from hill to lowland which occurs in practice. The Hill Station thus will provide much of the annual needs of Ruakura for store sheep, cattle, and breeding ewes.

Such flexible interchange of facilities leads to the maximum use of specialist staff and considerable economies. The same principle exists within the Animal Research Division as a whole. In hogget trials, for example, in addition to the advantage of running trials with similar hoggets on the hills and on both sheep and dairy areas at Ruakura, there is co-operation and active participation from the parasitological and pathological sections of the Department of Agriculture's Animal Research Station, Wallaceville, as well as from the biochemical and nutrition sections at Ruakura. This type of teamwork leads to more effective research and speeds up the solution of difficult problems. This year the Hill Station will also supply the Wallaceville Station with some 500 ram and wether lambs required for investigations in progress there.

The area, of which a plan is shown on page 429, is divided by the Hamilton-Raglan road into two portions. That on the east side of the road comprises 193 acres which it is planned will become the fattening area for sheep and cattle and where, for example, culled-for-age ewes from the hill area will be used for fat lamb production in the studies of lifetime performance of some of the experimental flocks. The remaining area runs whiteface sheep, breeding cows, and store cattle in experimental flocks and herds. The mixed-age breeding flock of 929 ewes and 300 ewe hoggets was taken over with the property in 1949. Wethers and cattle were not purchased.

Wide Range of Studies

The over-all objective of the Hill Station is the same as that of Ruakura, which has been defined by the Superintendent, Dr. C. P. McMeekan, in an article in "The New Zealand Journal of Agriculture" of May 1953 as "an attempt to place animal production on a factual basis". To this end a wide range of problems of breeding, feeding, and management will be studied.

The main aim of the research programme centres around the formulation of principles of animal production of wide application rather than in testing practices of

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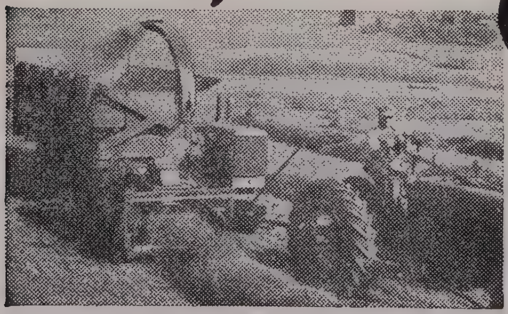

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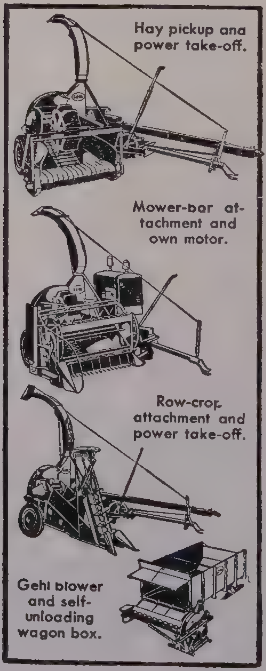
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only local significance, and in trying under practical New Zealand conditions, adapting and modifying where necessary, principles and practices evolved elsewhere which are likely to prove of value to the sheep and cattle industry. It is the reaction of the animal to the hill country environment that is the broad term of reference. The Station is concerned with the use of pasture rather than the production of pasture. Its function is not the investigation of methods of land development or hill country improvement, but the improvement of animal production on such country.

Methods of land development and improvement have been orthodox and normal and are based on what are believed to be the best and most efficient methods. It has been possible, however, to keep accurate costs of development and also, in many cases, to try alternative methods. In due course the results of such trials will be available. The assessment of changes in botanical composition of pastures as a result of differing manurial treatments, oversowing, burning and sowing, rates of stocking, etc., on the various soil types is being undertaken by pasture specialists of the Extension Division, Department of Agriculture, which also is interested in laying down seeding and manuring trials.

Although the Station was purchased in August 1949, no developmental work could be commenced until April 1950. Since that time efforts have been concentrated mainly on providing the essential field and laboratory facilities to permit accurate work with stock. Considerable time has also been devoted to developing techniques, training staff in their use, and, as facilities improve, acquiring by survey methods as much background and ecological information as possible.

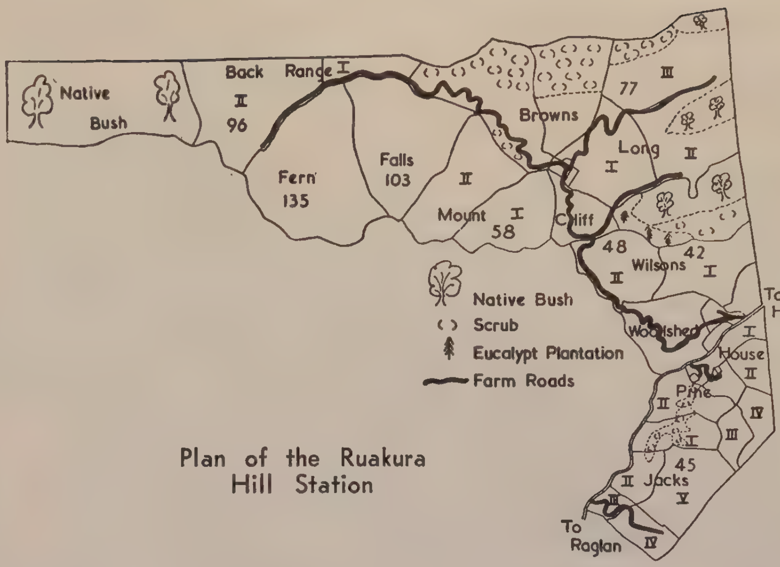
Improvements by Topdressing

Although the provision of research facilities has been the primary need, it has been desirable also to initiate improvement work so that both adequate stock numbers can be carried and the country raised to a level of productivity consistent with its basic character and its inherent potentialities.

Improvement commenced with topdressing in April 1950, when 100 tons of serpentine superphosphate was applied by aircraft. On most of the area the rate was 2cwt. per acre, but two paddocks, the "Back Range" of 116 acres and the "Fern" of 135 acres, received 3cwt. per acre. "The Mount" (118 acres) received 1cwt. per acre. At the same time 400 acres were oversown with 1lb. of Mt. Barker subterranean clover and 1lb. of Certified white clover per acre. This included areas differentially topdressed.

The even spread of the seed by aeroplane on this occasion has been reported in "The New Zealand Journal of Agriculture" for April 1951. Although in the year after sowing a good take was evident, it is only in the current year, after two further applications of superphosphate and a very good season, that the results from the oversowing have been so striking.

Experience to date on Ruakura hill country has shown that oversowing has probably been of somewhat less importance than topdressing and subdivision. Marked clover response followed topdressing and improved grazing. However, oversowing may be justified to introduce the more productive white clovers now available on the market.



Plan of the Ruakura Hill Station

Fencing and Subdivision

Fencing on the property at the time of purchase was nearly 17 miles, including $10\frac{1}{4}$ miles of boundary fence. Much boundary fence and most of the subdivision fences were not stock proof and had to be renewed as a first step in improvement work. Original paddock names have been retained and are shown on the plan above. Where subdivisions have been made these are shown numbered I, II, III, etc. Paddocks ranged from 220 acres ("Long Paddock") to about 60 acres, and subdivisions were necessary to enable the many experimental flocks to be segregated. As will be seen from the plan, many large fields have been retained so that extensive grazing conditions can be employed when required. New subdivisions have been made to a greater extent on the fattening area already mentioned, where development for this purpose was planned from the outset.

To date practically all major fencing requirements have been completed.

Fencing has been of the standard 7-wire, post and batten type. Posts have been mainly creosoted larch, but totara, red birch, and Australian hardwoods have also been used. Over 1 mile of Hunter fencing has been erected to test its efficiency. In addition to a considerable saving in material of up to £100 or more per mile, this type of fencing offers a big saving in packing costs, as, for example, sufficient battens for a strain can be carried in a sugar bag. On many old fencelines sufficient posts and footing material are usually available for Hunter fencing.

In the Hunter fencing system 11-gauge galvanised chain with patent clips is used as battens. In the dips on the line, instead of posts being used, the wires are fastened to 9-gauge chains which are anchored with patent stainless steel wire to either timber or concrete footing. On the flat, posts are widely spaced and the fence left swinging. Each strain is strained from the middle, where a short section of chain is incorporated in each wire. Re-straining is rapidly done by dropping links in these chains, which are fastened with wire pins. Full details are supplied by the manufacturers.

Eradication of Fern

Bracken fern covered large areas of the property when it was purchased. In the control and eradication of fern two main methods have been used. Burning in the autumn and oversowing with a grass seed mixture were tried on small areas in 1951 and on 100 acres ("Fern Paddock") in 1952. Although in 1952 the sowing was delayed until May, a splendid result was achieved, the area now being almost free of fern and carrying a first-class sward of English grasses and clovers. The crushing of fern by cattle and mob grazing by sheep, followed by cattle, have given a slower result but a sure one with bracken where good pasture species were already present in the sward, but in contrast to burning had no effect on hard fern. In both methods topdressing before treatment has greatly accelerated results.

Subdivision, enabling concentrations of cattle of 1 to 2 or more beasts per acre, has greatly accelerated fern control and has been sparing of the cattle, in that long periods in a paddock to achieve a good result have been avoided so that the cattle were not forced to lose too much condition. A big concentration of cattle in a paddock already grazed by sheep results in hungry cattle and, therefore, foraging cattle in a few days instead of weeks or months, and a short, sharp check appears less harmful than prolonged semi-starvation. In the control of hard fern there seems to be no alternative to burning, as summer and autumn weather conditions permit, and oversowing.

Control of Scrub and Gorse

Scrub or manuka, where it is scattered, has been cut and left to lie. About 100 acres have been dealt with in this way and topdressed into a good

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sward. Dense scrub on tractor country has been crushed and burnt and the areas disced and cultivated and sown to grass in the autumn. About 80 acres have been so treated. Gorse is a troublesome weed and has been sprayed with 2,4,5-T. In 1952 some areas were treated, 1 gallon of the concentrate to 100 gallons of water being applied with a low-volume pump. Results were disappointing, probably owing to inadequate wetting of the gorse.

This year, with the use of 1 gallon of the concentrate to 200 to 300 gallons of water, applied with a high-pressure pump, an almost complete kill has been achieved for the same expenditure of hormone. It is estimated that this summer practically all the gorse on the Station can be sprayed in a few weeks, leaving very little in inaccessible places to be grubbed.

Cropping to the extent of about 15 acres per year has been done to assist in the eradication of gorse and blackberry and to provide some additional winter feed. Swedes, chou moellier, thousand-headed kale, and ryecorn have been tried. Thousand-headed kale has given fair results, but, as expected, has been unpalatable to hoggets. Ryecorn shows great promise, being palatable and growing well on poor soils. It is to be tried as a catch crop after swedes and kale and before sowing to grass in the autumn. It is, however, subject to rust in wet summers.

Animal Pests Checked

Rabbits threatened to be a serious trouble on the area at the outset and poison was laid in 1951. Although only a few hundred rabbits were destroyed, the population has steadily declined since that time, and today they present no problem. Goats, too, wandered freely over the property and adjoining bush. With improved fencing, numbers have been kept within reasonable bounds.

Wild pigs, although not known to kill sheep or lambs on the property, are attracted by carcasses and do considerable damage by rooting. Phosphorus poison has proved very effective and is regularly used.

Standard Stock Yards

Sheep yards built to a standard design, modified to suit research requirements, and capable of handling about 600 sheep have been built at the woolshed and also at the centre of the area (see plan on page 429) about 2 miles from the shed. At each yard weighing facilities have been installed. Thus, all sheep are reasonably adjacent to yards for sampling in various ways, measuring, weighing, etc. Cattle yards, constructed of totara, rimu, and tanekaha grown on the area, have been built in a central position. A weigh-bridge has been installed. As there were no dipping facilities on the area, a power spray dip was erected in the first year.

Good Road Access

A well-formed road from the woolshed to the top yards was a valuable asset on the Station from the outset. It has been trimmed, graded, and metalled, culverts have been installed, and it has been made into an all-weather road. The road greatly facilitates work through more rapid and easy transport of equipment and staff to the centre of operations. Its greatest value, and the major reason for its development, lies in the facility with which visiting farmers and scientific workers can be shown the work of the Station. From the top yards about 1½ miles of fine-weather road negotiable by "Land Rover" and tractor have been constructed to the back of the Station.

Part of the Ruakura Hill Station, the land on which is typical of múch of the farmable hills of the North Island.

Shelter and shade trees have been planted where necessary. Some 6000 eucalypts, comprising about 15 species of timber merit, have been planted during the last 3 years on a very low-fertility area which is subject to erosion. Some species planted among tall scrub as nurse trees are already competing successfully with the scrub. Where small areas covered with gorse are steep and inaccessible a start has been made in planting *Pinus radiata*, and it is planned also to use *Cupressus macrocarpa* as a smother species.

Extension of Buildings

When the property was purchased the buildings consisted of a small but well-built two-stand woolshed and an old house beyond repair. The woolshed was extended in 1951, and in 1952 portion of the laboratory was added, an implement shed was shifted from Ruakura, and quarters for single men were completed. Three houses for professional staff were also built, and this year two cottages for technical staff have been completed. Field laboratories, adequately equipped for most of the work contemplated, are within a few weeks of completion.

Staff Arrangements

Those of the staff living at the Hill Station are primarily engaged in work at that centre, but they are also intimately associated with research work centred at Ruakura. The converse is also true. The hill country team is led by E. A. Clarke, formerly head of the Sheep Husbandry Department, Massey Agricultural College. With him are three professional officers: Dr. D. G. Edgar, a New Zealander who trained in veterinary science at Edinburgh and who obtained his doctorate at Cambridge for work on reproduction in sheep; I. Inkster, a first class honours graduate in sheep husbandry from Massey College and lately of the staff of that institution; and Miss D. Filmer, a pure science graduate of Victoria College who has specialised in parasitology at the Wallaceville Animal Research Station for several years. These are assisted by five technical officers and a field staff of four men.

Livestock Statistics

The livestock on the Station at present, contrasted with that wintered in 1950 (the second winter after purchase), is as follows:—

	1950	1953
Hoggets	200	560
Ewes	1075	1660
Rams, teasers, and wethers	39	80
	1314	2300
Cows	—	45
Heifers	—	18
Yearlings	—	38
Steers—4 years	—	62
3 years ..	167	100
2 years ..		28
Bulls	—	2
	167	293
Horses	3	7

In 1950 the Station was not understocked. In the present year, a particularly good one so far, feed is abundant.

With initial development work in terms of necessary facilities completed and improvement of productivity well under way, the Station is now in a position to devote its time fully to the work for which it was acquired. Further land developments and pasture improvement will proceed along orderly lines as on any farm. Already several projects have been commenced. These and plans for additional work are outlined on the next page.

Hogget Rearing Trials

The problem of ill thrift in hoggets needs no lengthy description in a New Zealand farming journal. At some time, and frequently too often for comfort, most farmers have experienced not merely the financial loss of poor growth in their young sheep, but also the devastating mortality which periodically occurs. Ruakura's hill country team have decided to attempt a systematic study of hogget rearing to map accurately the precise importance and effect of the many interesting factors involved in this national problem. In initial investigations many fairly large groups are being studied under a variety of widely different conditions. Thus, hoggets are being reared on the Hill Station itself on improved and relatively unimproved pastures, on Ruakura on typical fattening swards, and on Ruakura dairy pastures.

Factors such as drenching, length and quality of feed, rates of stocking, pre-weaning treatments, and seasonal conditions are being investigated. Much effort is being devoted to determining whether internal parasites are a primary or a secondary factor. Detailed biochemical studies have been commenced on the feed intake of hoggets on pasture at different stages of growth. The special role of rickets as a causal factor in unthrift of hoggets in the Waikato has already been demonstrated and is under special study. As technique permits, the interrelationship of rumen flora, rumen digestion, and hogget thrift will be measured.

Bearing Trouble Investigation

One of the first problems to which attention was devoted was that of bearing trouble. This also has a national spread in its incidence and importance. A start was made in the summer of 1951 to collect a flock of ewes which had had this trouble, but which might be expected to breed again. Many farmers co-operated in supplying animals of this type.

Since 1951 a flock of 100 ewes has been built up, every member of which has had bearing disease. With the use of this flock and its progeny, work is proceeding along four main lines:—

(a) **Hereditary aspects** are being studied by breeding from affected ewes and their progeny, using rams from affected ewes;

(b) **Anatomical aspects** are being examined. The mode of pelvic relaxation of normal and affected sheep during advanced pregnancy is being measured, since the anatomy of the disease is not yet understood;

(c) **Hormone levels** in the blood and urine of normal and affected sheep are being determined to measure the role of these secretions on the development of the disease;

(d) **Nutrition aspects** are being watched by careful records of feed and incidence as a guide to more precise trials.

Infertility in Sheep

Special investigations concerned with ewe fertility have been commenced. These include studies of levels of certain hormones in the blood of ewes throughout the breeding season and throughout the oestrus cycle. Mature ewes of proven fertility, 2-tooth ewes, well and poorly reared, and shy-breeding ewes are being followed in this way. In addition, proven non-breeders and infertile 2-tooth ewes are being killed and examined to determine and classify causes of infertility.

Implantations with a hormone have been made at a critical period after tupping in 2-tooth ewes to study the effect on fertility. These illustrate the detailed type of investigations thought necessary to solve the age-old problem of impaired fertility in sheep.

Cross-breeding Studies

Cross-breeding is being investigated because of the spectacular results achieved in New Zealand and overseas from this form of breeding. Cross-breeding played a major role in the foundation of most, if not all, breeds, and the New Zealand Romney, in its formative years, benefited from crosses with several breeds. In England cross-breeding is exploited, for example, in the Border Leicester x Cheviot ewe, which is the fat lamb ewe par excellence, and many trials have shown superiority in cross-breds, especially in higher fertility, more viable and thriftier lambs, and increased returns. Cross-breeding, however, is not to be lightly embarked on, and no recommendations can be made at this stage.

Interest at Ruakura centres around the Border-Romney cross, particularly because of the high fertility of the Border Leicester, and in the Ruakura trials the first cross is being bred back to the Romney in an endeavour to retain the high fertility of the Border and lose little of the good qualities of the Romney.

One hundred Station-bred and a similar number of very high-quality purchased ewes are being used each year. Equal numbers of each are mated to selected Border rams and to Romney rams and the progeny bred back to the Romney.

Except at mating, the ewes are run together as one flock, and the cross-bred progeny and the Romney controls are run together continuously. This year 60 2-tooth half-bred ewes are being mated for the first time. In the course of these studies over the past 2 years the remarkably high fertility and productivity of brought-in Romney ewes under hill country conditions have been strikingly demonstrated. These ewes have given from 20 to 30 per cent. better lambing percentage results. No special management practices were used to achieve this unexpected result. Station-bred ewes were run with the brought-in ewes and received exactly the same treatment. It is believed that the reason may be environmental and associated perhaps with the previous management of the ewes or the change to such a different environment. This year 5-year-old ewes from the same source are again being used to collect further data.

Special Sheep Breeding Studies

Breeding studies contemplated within the Romney breed aim at testing the effect of intense selection for fleece weight only. This work is a natural corollary to previous work of Ruakura which showed that conformation in the Romney is relatively unimportant in the culled-for-age ewe used as a fat lamb dam and mated to such a prepotent fat lamb sire as the Southdown.

Future work also aims at breeding Romney rams under realistic conditions in the enviroment under which they are expected to perform. Work at Ruakura on dairy cows and overseas on small animals indicates that efficient selection can be made without the aid of the best environmental conditions. The performance of hill-bred and selected rams will be contrasted with that of rams from lowland conditions. Particular interest centres in the thrift and working ability of 2-tooth rams. This subject has long been of considerable practical interest to New Zealand sheep men, since most studs are located on lowland country and most rams are reared on hill country.

Steers under Hill Conditions

After the installation of a cattle weighbridge last year work commenced on the collection of factual information on the growth curves of cattle used in pasture improvement. Work is to be done on the effects of growth checks of varying intensity at different periods of the animals' life on subsequent fattening qualities. Trials have been commenced on the relative performances of Aberdeen Angus and Galloway x Aberdeen steers under hill conditions from weaning onward. Small numbers only are available, but it is hoped to extend this work and to include samples of the main breeds and crosses.

The breeding herd consists of Aberdeen Angus cattle and it is aimed to build up rapidly a herd of 100 cows. This will enable all cattle to be bred on the place, so that complete lifetime records are available, which will permit detailed large-scale cattle management studies to be undertaken.

Detailed Records Kept

Research of the type thus briefly described obviously needs accurate records. Each animal is, therefore, identified at birth with a numbered brass ear-tag and its history and lifetime production are recorded in considerable detail, despite the great difficulties of such work under hill conditions. It will be possible from these records to determine the effects of many practices and treatments on subsequent production. The subsequent performance of differently reared hoggets is an example of the value of such survey methods. Such methods also provide badly needed factual records of the performance of sheep on hill country as a guide to problems and to enable the major causes of inefficiency to be pinpointed. Similarly such methods are essential to work on the relative performance of sheep on high and low planes of nutrition throughout their entire lifetime, with particular reference to fertility, lambing mortality, and hogget rearing. Studies of this type have been started.

Conclusion

In the planning of the work at the Ruakura Hill Country Station it is hoped to preserve a broad and balanced outlook and keep an eye to the future of the sheep and cattle industry. In particular, it is believed that the improvement of hill country can and must be achieved, and that in the long run the country will be improved up to the Romney so that the sheep need not be bred down to deteriorating country.

Eradication of Tall Fescue on Hauraki Plains

By G. L. BANFIELD, Instructor in Agriculture, Department of Agriculture, Thames

TALL fescue remains the major weed problem on the more poorly drained areas of the Hauraki Plains. Some farmers have been particularly successful in bringing about eradication of tall fescue, but others have achieved little, because they have failed to appreciate certain fundamental principles. It is the intention of this article to set out the principles of eradication with the hope that further failures will be avoided.

Tall fescue invading first-class pasture land. Because tall fescue is neglected by stock, it rapidly smothers out the useful pasture plants until it becomes the dominant species.

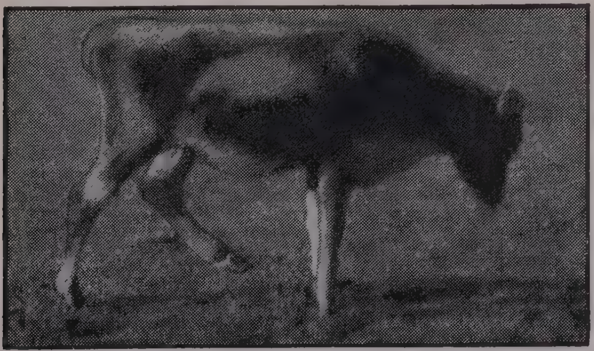
TALL fescue (*Festuca arundinacea*) grows most freely on semi-drained, fertile alluvial land, where very frequently it was introduced by farmers as a pioneering grass. Tales are still told of the trouble to which some farmers went to introduce a grass that later became recognised as a serious weed; they spent the rest of their lives digging it out.

On the Hauraki Plains the most badly infested areas occur just within the stop-banks situated along the Piako and Waihou Rivers and the stop-bank confronting the Thames estuary. No doubt this is partly because many of these areas are more poorly drained than other areas and partly because they have been subject to re-infestation by water-borne seed left by receding floods. The stop-banks and roadsides form a natural nursery from which paddocks are continually reseeded.

Tall fescue is a weed without any redeeming feature. It is relatively unpalatable, particularly to cattle, and because it is neglected, it rapidly smothers out the useful pasture species until it is almost completely dominant. Symptoms identical with those of ergot poisoning occur in cattle grazing tall fescue, even though there is no sign of actual ergot infestation.

Importance of Drainage

Tall fescue is rarely a problem on well-drained land and any programme for its eradication must be based on improving drainage. On the Hauraki Plains, where underground drains are at present out of the question owing to a high water-table, surface drains must be used if any permanent control of tall fescue is to be obtained. These must be constructed before an area is sown back to permanent pasture at the completion of a tall fescue eradication programme.



Calf losing hoof as a result of tall fescue poisoning at Oronga, Hauraki Plains. The poison restricts the small blood vessels in the vicinity of the extremities, giving rise to dry gangrene.

Eradication

There are two distinct phases in the eradication of tall fescue: First, the destruction of the existing plants; secondly, the destruction of the seed already in the ground.

Destruction of Existing Plants

1. **Deep ploughing:** Tall fescue is not a twitch, so that if it can be completely buried by ploughing, it will rot and the first objective, the destruction of the existing plants, should be achieved. In practice this is not as easy as it may sound unless most of the rank growth is first removed by grazing or burning or with a grader blade. Even then unless the area is expertly ploughed a considerable amount of tall fescue may still find the light. Rolling on the furrow immediately after ploughing is a considerable help in getting the tall fescue plants completely buried. Subsequent working in preparation for a crop must be shallow so that tall fescue turves will not be dragged to the surface. Ploughing has the advantage that most of the seed is turned under to a depth at which it is not likely to germinate. However, where there is no great depth of topsoil it is not desirable to lose it by turning it under.

2. **Giant discing:** With discing, as with ploughing, as much of the rank growth as possible should be removed before operations begin. Discing must be started as early in spring as is possible so that something approaching a seed-bed can be obtained for the sowing of a crop. Preferably discing should be followed by a summer fallow, during which frequent discings are carried out until the tall fescue plants are dead. This result will be achieved more readily during a dry summer. Even when the tall fescue plants are dead they are still in the way and should be raked up and burnt.

3. **Rotary hoeing:** The rotary hoe has proved very successful on the Hauraki Plains in dealing with tall fescue. Three or four cuts with the hoe after as much as possible of the top hamper has been removed result in a reasonable seed-bed for large seeds such as maize and pumpkins. The tall fescue is chopped into pieces small enough to be of very little further consequence. On country where tall fescue

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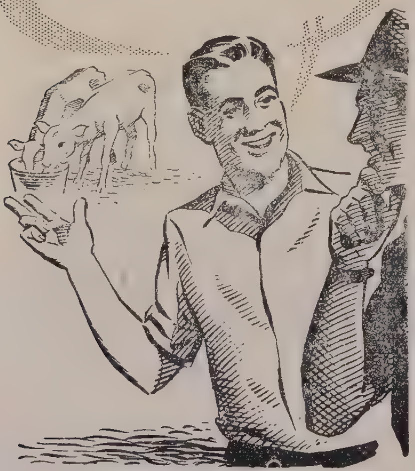

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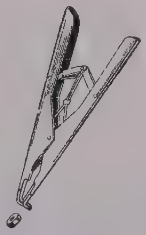

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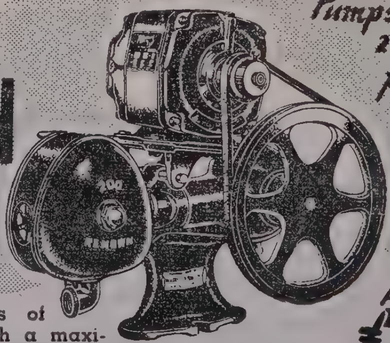

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is a problem it is often too wet to get on to the land with implements until the time for sowing the crop seed is almost at hand. The rotary hoe provides a means of preparing a rough seed-bed very quickly once moisture conditions are suitable. Though consolidation is poor in such a hurriedly prepared seed-bed, this is usually not of much consequence in spring, when there is plenty of moisture.

Destruction of Seed in the Ground

Tall fescue is a most prolific producer of viable seed and this must be eliminated from the top 3 or 4in. of soil before sowing down to permanent pasture. Two summer fallows are ideal, as they allow successive crops of tall fescue seedlings to be harrowed or hoed without the hindrance of a crop. One farmer on the Hauraki Plains has employed this method and has certainly succeeded in obtaining a final seed-bed very free of tall fescue seed. However, this method may be considered unduly expensive, because a crop taken in the first year, though not quite as effective as a fallow, is a compromise worth accepting.

Crops such as maize, pumpkins, and potatoes, which allow for a certain amount of inter-row cultivation, are to be preferred. Maize is a crop which has been used with success by some farmers; it does not require a fine seed-bed and its rapid, tall growth is helpful in holding weeds in check.

Chou moellier is also particularly useful because heavy stocking on it in winter, especially with sheep, tends to result in the tramping out of regenerating tall fescue plants and seedlings at a time when the tall fescue cannot be dealt with by implements.

Excellent pasture 9 months old which was established after a 2-year tall fescue-eradication programme.

One farmer on the Hauraki Plains who has been conspicuously successful in the eradication of tall fescue from a large, badly infested property has made very profitable use of crops of pumpkins. His method is to remove as much top hamper as is possible by grazing or other means and then prepare a rough seed-bed with the rotary hoe. He finds that three or four cuts are usually required on the stiff clay which makes up his property. Pumpkins are sown in rows 4yds. apart. They are cheap and easy to sow and do not require a first-class seed-bed. Three inter-row cultivations with the rotary hoe are possible, thus assisting in the destruction of tall fescue seedlings in a way which would not be possible with all classes of crops.

Tall fescue growing on roadside. If permanent freedom from tall fescue is to be obtained, it is necessary to clean up such sources of infection.

Profits from the sale of the pumpkins have always been sufficient to pay for the eradication of the tall fescue and re-establishment of permanent pasture. Actually in no season has the pumpkin crop been worth less than £20 per acre.

The paddock on which the pumpkins are grown is fallowed during the second season, during which successive crops of tall fescue seedlings are destroyed by harrowing or rotary hoeing. Surface drains are also constructed with the grader at ½ chain intervals during the fallow. After the fallow the area is sown down to pasture in autumn in the normal way.

Sowing to Pasture

As a result of a summer fallow and frequent workings during it to destroy germinating tall fescue seedlings an excellent seed-bed can usually be obtained. For sowing down at the completion of operations a mixture such as the following is suitable:—

	lb.
Certified perennial ryegrass ..	20
Certified short-rotation ryegrass	10
Certified timothy	4
Certified white clover ..	2
Certified red clover	2
Total	38

Subsequent Management

On the Hauraki Plains sheep are essential for controlling new pasture during the first winter and spring. Cattle will poach the new pasture very badly, whereas sheep maintain the ryegrass and weeds such as buttercup at such a level that clover can

Strong growth of *Phalaris tuberosa* on a stop-bank. This grass is able to suppress and finally to replace tall fescue growing on stop-banks, drain-banks, and roadsides.

establish satisfactorily. Sheep also tend to produce and maintain an even consolidated surface on the paddock.

Grazing with large numbers of sheep for short periods is preferable to long periods of grazing with smaller numbers. At this stage more harm is done by under-grazing than by over-grazing. By keeping the growth fairly short the sheep will chew off any tall fescue which happens to get away.

It is of course important to avoid haymaking, as shutting up for hay may permit the seeding of any tall fescue plants which may remain.

Avoiding Re-infestation

As the worst infested areas are adjoining stop-banks, roadsides, and drain-banks, permanent freedom from tall fescue will not be obtained until unoccupied areas which are sources of infection are cleaned up.

Use of *Phalaris tuberosa*

Phalaris tuberosa grows taller and even more vigorously than tall fescue, provided it is left ungrazed. It makes tremendous growth during autumn and winter, when tall fescue is practically at a standstill. Because of this advantage it is able gradually to suppress tall fescue and finally replace it. Every effort should be made to introduce *Phalaris tuberosa* so that clean paddocks are not subject to re-infestation by tall fescue. *Phalaris tuberosa* can be introduced in autumn by transplanting or by oversowing after a burn. As might be expected, however, the best results are obtained by sowing the seed on a properly prepared seed-bed. It is important that the seed should be sown alone, as it will not stand competition in the first year of its establishment.

As *Phalaris tuberosa* is eaten by stock, it is only where the grass is growing out of their reach that it is capable of suppressing the tall fescue. *Phalaris tuberosa* is not likely to replace the tall fescue as a further menace, as it is not normally poisonous and is palatable to such a degree that it is not likely to invade pastures. Once tall fescue is completely suppressed *Phalaris tuberosa* may be grazed and it will be found to provide a wealth of winter feed.

Chemical Methods of Control

In a trial carried out on the Hauraki Plains to control tall fescue growing along drain-banks sodium chlorate sprayed at the rate of 5cwt. per acre (2oz. per square yard approximately) produced a 95 per cent. kill of the tall fescue despite exceptionally heavy rainfall, which would have tended to leach sodium chlorate from the soil before its task was completed. The chemical kills all grasses and weeds down to the waterline in a drain, but will not kill weeds which are submerged. For this reason spraying is best done from December onward, when the water levels in drains are likely to be lowest. As sodium chlorate does not kill ungerminated seeds in the ground, further applications of spray are necessary in succeeding seasons. One application at the rate stated would cost approximately 5s. per chain for an average farm drain.

T.C.A., which has been very successful in killing most grasses, was also tried in the experiment at rates up to 200lb. per acre, but it failed to produce a satisfactory kill.

Conclusion

Tall fescue has proved an almost insurmountable problem to some farmers, but a relatively simple problem to those who have followed a programme of eradication based on the following:—

1. Improvement of drainage to a degree which allows the better pasture species to thrive.

2. The killing of the tall fescue plants either by complete burial with the plough or by frequent working with discs or rotary hoe.

3. Use of the summer fallow or a crop plus summer fallow to destroy as many tall fescue seeds as possible.

4. Use of sheep for grazing the new pasture in its first 6 months.

5. Digging out of any tall fescue plants which may survive.

6. Cleaning up of sources of infection such as stop-banks, roadsides, and drain-banks.

Vaccination against Contagious Abortion

APPLICATIONS by farmers for vaccination of their calves against contagious abortion in 1954 are now due. The charge is 2s. per calf irrespective of the number involved. The closing date for applications for dairy calves is 14 January and for beef calves 2 August. A late fee of 10s. will be payable on any application received after these dates.

As in previous years members of veterinary clubs should apply to the secretary of their club, and other farmers should apply to their nearest Livestock Instructor, from whom they can obtain the necessary application forms. Applications to Livestock Instructors must be accompanied by a cash payment calculated on the basis of the charge mentioned above.

It is desirable that applications should be sent in as early as possible so that vaccinating officers can arrange the work efficiently. Farmers are therefore requested to forward their applications by 4 January.

Blackhead in Pullets

By J. J. THOMPSON, Veterinary Research Officer (Poultry), Department of Agriculture, Wellington

BLACKHEAD is normally regarded as a disease of turkeys, but outbreaks with severe effects are occurring quite frequently among young pullets. The symptoms and post-mortem appearance closely resemble, and may be mistaken for, those of coccidiosis. Since an attack may follow an outbreak of fowl pox or vaccination with fowl pox vaccine, recognition of the early symptoms of the disease is important.

THE name blackhead is derived from the dark appearance of the skin of the head, sometimes observed in affected turkeys. The disease is a sub-acute or chronic infectious disease caused through invasion of the caecum and liver by a microscopic parasite *Histomonas meleagridis*; hence the proper name of the disease, infectious entero-hepatitis.

Cause

The parasite, present in the caecum of normal birds without producing disease symptoms, is passed out in the droppings. It does not appear to be very resistant to outside conditions and is rapidly killed by drying, but, despite this vulnerability to outside influences, the disease organisms have been known to survive 6 months or more in pastures or yards which had held diseased birds.

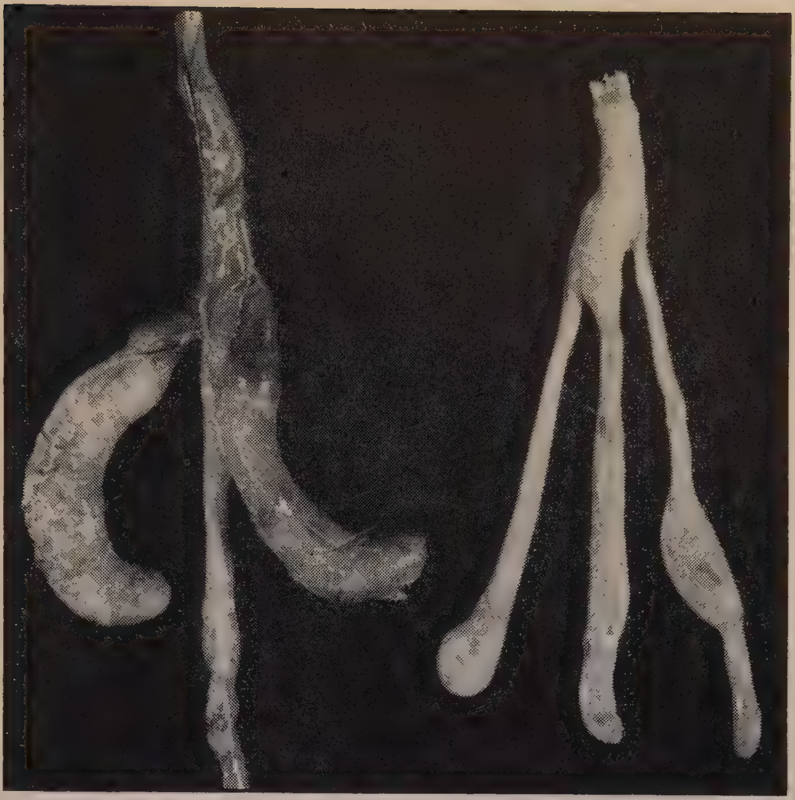
Although it has long been recognised that the caecal worm played a part in the transmission of blackhead, it is only within recent years that the true picture has been obtained. The eggs of the caecal worm at a certain stage of development carry the parasite and serve to protect it on pastures or litter from severe climatic conditions. When the worm eggs are picked up by susceptible birds the blackhead parasite is also released and invades the caecal wall.

Reason for Outbreaks

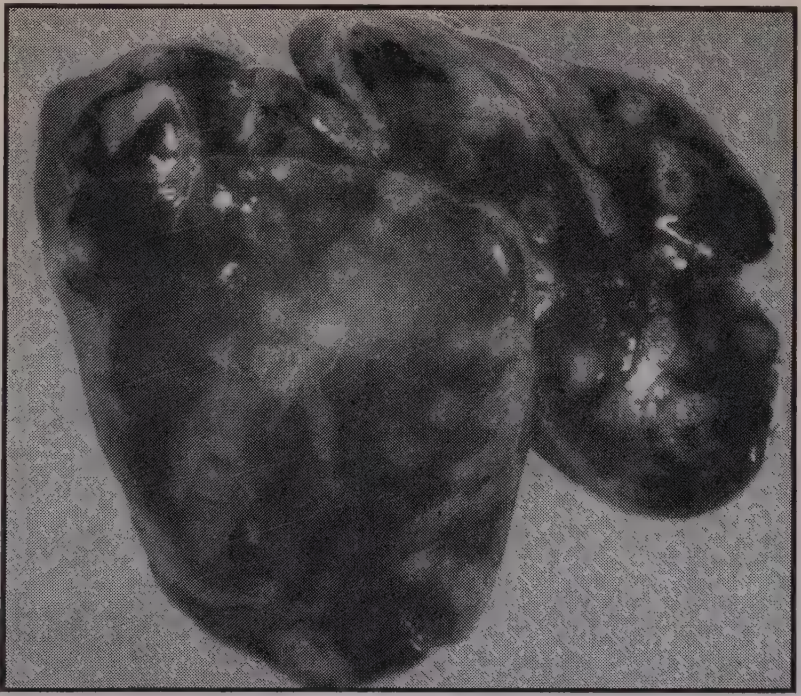
Poultry appear to have a natural resistance to the blackhead parasite, but certain adverse conditions such as damp litter, overcrowding, or poor feeding may influence the strength of this resistance. Birds 6 weeks to 4 months old are most susceptible and setbacks during their growing period can start off the disease.

Sudden changes of feed or management or an outbreak of another disease, which reduces the birds' condition, can be followed by an outbreak of blackhead.

The effect on young pullets of fowl pox vaccination is sometimes sufficient to precipitate an outbreak. This is usually evident about 2 or 3 weeks after vaccination, and is the result of vaccinating birds in poor condition or of using a very potent vaccine, which gives too violent a reaction. An outbreak of fowl pox in the flock or a prolonged spell of wet, cold weather may also act as a predisposing cause.



Above—Blind gut of young pullet affected with blackhead (left) compared with a normal gut (right). The swelling of the gut at left is caused by a yellow, cheesy mass of exudate mixed with blood inside the gut. Rounded yellow-white ulcers may also be observed from the outside. Below—Typical rounded lesions of blackhead on the liver of a pullet. These ulcers, which are common in affected turkeys, are present in only 5 to 10 per cent. of affected chickens.



Symptoms

Generally the symptoms in poultry are very similar to those of coccidiosis. The birds lose condition and stand in a huddled position with eyes half closed and feathers ruffled. Their faces may have a dark bluish tinge, combs and legs are pale, and yellow-orange diarrhoea is common. Occasionally in acute cases blood is present in the droppings.

Post-mortem Appearance

The typical liver lesions as seen in turkeys are present in only a small percentage of affected poultry. The caecum or blind gut is nearly always affected and is filled with a cheesy yellow mass covering ulcers in the caecal wall. Blood may also be seen in the centre of the caecum. The liver lesions, if present, are round, yellowish green, and surrounded by a lighter-coloured zone. These ulcer-like markings are very distinctive and usually slightly depressed below the surface of the organ.

Usually laboratory examination is necessary to distinguish the condition from coccidiosis.

Prevention and Control

The measures advised for control of coccidiosis, such as attention to hygiene, dry litter, and avoidance of overcrowding and sudden changes in feeding or management, are necessary for the prevention of blackhead. Fowl pox vaccination should be postponed if the birds are in poor condition, and after vaccination the flock should be closely watched until the reaction to the vaccine has passed.

If an outbreak occurs, the house or run should be regarded as infected and left empty if possible for some months. Recovered birds will continue to pass large numbers of the parasites in their droppings.

The part played in the spread of infection by the caecal worm is important. These worms can be eliminated by dosing the flock with phenothiazine at the rate of 1oz. of the drug to 14lb. of feed or 2oz. to each 100 birds. The phenothiazine must be thoroughly mixed in the mash and fed in the morning after food has been withheld for 18 hours. Dosing should be repeated in 2 to 4 weeks. Phenothiazine has no curative effect on blackhead, and should be used only as treatment for caecal worms.

Another preparation incorporating phenothiazine and nicotine sulphate and effective against both caecal and round worms is now available in New Zealand. It can also be fed in the mash.

Very effective treatment of blackhead is now possible through the introduction of a drug known in the United States as enheptin T and sold in this country under the trade name "Entramin". "Entramin" is of value for both preventive and curative purposes, and should be used according to the manufacturers' instructions.

Main Points

The main points about blackhead may be summarised as follows:—

Blackhead can cause severe loss in young pullets which have received a setback, for example, after fowl pox vaccination.

The caecal worm egg plays the part of carrier of the blackhead parasite, ensuring a longer period of survival in pasture or house. Caecal worms can be eliminated by dosing with phenothiazine in the mash.

The disease in pullets is not readily recognised and laboratory examination may be necessary.

Treatment is effective if the new drug enheptin T (trade name "Entramin") is properly used.

If the disease is suspected in a flock, the local Poultry Instructor or Veterinarian of the Department of Agriculture should be consulted for further advice on diagnosis and treatment of the condition. A number of affected birds may be dispatched to the Department of Agriculture's Animal Research Station, Wallaceville, for laboratory confirmation of the presence of the disease in the flock.

Bulletins for the Commercial Poultry Keeper

Free Bulletins

Nos.

239 Curd Feeding to Poultry.

318 Pullorum Disease.

327 Internal and External Parasites of Poultry.

331 Symptoms and Control of Fowl Pox.

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197 Theory and Practice of Incubation. 6d.

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The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Show Dates

THE following are dates and venues of A. and P. Shows until late February:—

NORTH ISLAND

December

*5 December—Helensville A. and P. at Helensville.

5 December—Hauraki A. and P. at Paeroa.

January

1 January—Nuhaka A. and P. at Nuhaka.

4 and 5 January—Rotorua A. and P. at Rotorua.

*15 and 16 January—Wairoa County A. and P. at Wairoa.

16 January—Marton District A. and P. at Marton.

23 January—Central Hawkes Bay A. and P. at Waipukurau.

26 and 27 January—Feilding Industrial A. and P. at Feilding.

28 and 29 January—Hawkes Bay Ram Fair at Hastings.

29 and 30 January—Horowhenua A. and P. at Levin.

*30 January—North Kaipara Agricultural Association at Paparoa.

February

*5 and 6 February—Rodney Agricultural Society at Warkworth.

6 February—Clevedon A. and P. at Clevedon.

6 February—Woodville A. and P. at Woodville.

6 February—Rangitikei A. and P. at Taihape.

9 and 10 February—Dannevirke District A. and P. at Dannevirke.

12 February—Dannevirke Ram Fair at Dannevirke.

12 and 13 February—Taumarunui District A. and P. at Taumarunui.

12 and 13 February—Taranaki Agricultural Society at New Plymouth.

13 February—Hukerenui A. and P. at Hukerenui.

*13 February—Waitemata A. and P. at Waiwera North.

13 February—Pahiatua A. and P. at Pahiatua.

17 February—Te Awamutu A., P., and H. at Te Awamutu.

19 and 20 February—Masterton A. and P. at Masterton.

19 and 20 February—Franklin A. and P. at Pukekohe.

*20 February—Northern Wairoa A. and P. at Arapohue.

20 February—Waiapu P. and I. at Ruatoria.

20 February—Whangaroa A. and P. at Kaeo.

SOUTH ISLAND

December

1 and 2 December—Gore A. and P. at Gore.

5 December—Tokomairiro A. and P. at Milton.

5 December—Wyndham A. and P. at Wyndham.

12 December—Otago Peninsula A. and P. at Portobello.

January

9 January—Blueskin A. and P. at Waitati.

16 January—Waikouaiti A. and P. at Waikouaiti.

23 January—Palmerston and Waihemo County A. and P. at Palmerston.

*27, 28, and 29 January—Southland A. and P. (Royal Show) at Invercargill.

February

*6 February—Golden Bay Agricultural Association at Takaka.

20 February—Banks Peninsula A. and P. at Little River.

20 February—Murchison A. and P. at Murchison.

20 February—Waiau A. and P. at Tuatapere.

20 February—Buller A. and P. at Westport.

* The Department of Agriculture exhibit will be staged at this show.

Development of Light Land in North Canterbury

OF the 2.7 million acres of flat and easy rolling country in Canterbury, a fifth comprises stony and bouldery soils of the plains, the production from which is relatively low. During recent years, however, a number of farmers by adopting improved dry-land farming techniques have achieved marked production increases, and in this article E. C. Withell, Fields Instructor, Department of Agriculture, Rangiora, outlines the practices adopted by a North Canterbury (Waipara) farmer who has a farm on this type of soil.

MOST of the droughty soils of the Canterbury Plains have an annual rainfall of approximately 25in. which, though fairly evenly distributed throughout the year, is often less effective in late summer and early autumn because of dry north-west winds, which are prevalent at that time. These climatic conditions associated with the low moisture-holding capacity of the soils cause pastures to burn up in late summer and early autumn, and white clover disappears in 2 or 3 years. Up to the 1930s most of the pastures consisted of dry-land browntop, danthonia, hairgrass, and sweet vernal, and the carrying capacity was about 1 ewe per acre. The production from these droughty soils consisted of wool and store sheep.

Since the late 1930s there have been changes and, by the use of subterranean clover, the establishment of lucerne stands, the increased use of lime, and latterly of a special-purpose pasture of lucerne and cocksfoot, a number of farms on the droughty soils have been improved considerably.

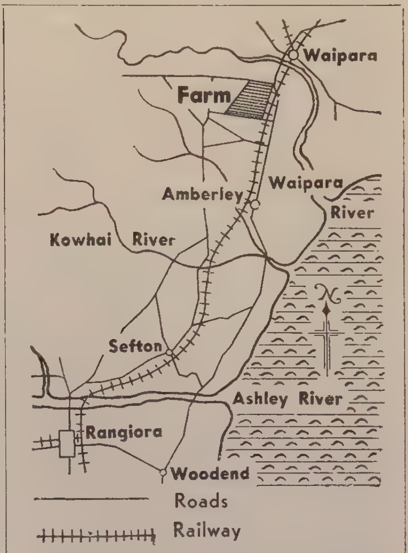
North Canterbury Light Land

Three miles north of Amberley and immediately south of the Waipara River there is an area of approximately 7000 acres of these droughty soils. Here there are two main soil types, the Glasnevin stony sandy loam and the Glasnevin very stony sandy loam. The former has a soil profile of 8in. of dark grey-brown sandy loam and 8in. of pale yellow stony sandy loam on loose gravel and the latter 6in. of grey-brown very sandy loam over 3in. of pale yellow very stony loam on loose gravel.

On this typical droughty soil area a North Canterbury farmer over 9 years has increased the number of stock on his property from 550 breeding ewes to 1300 ewes and 400 ewe hoggets. Wool production has increased from 18 to 60 bales, and 20 head of cattle are now run to control surplus growth.

The farm consists of 1170 acres and has an unimproved value of £3 per acre. The original pastures supported less than ½ ewe per acre. It was purchased by its present owner, a returned serviceman, in June 1944, though at the time the property was considered an uneconomic unit. It was subdivided into seven paddocks, two of which contained shelter belts. A reasonably good perennial ryegrass-subterranean clover-white clover sward was established on 100 acres, the remaining pastures having run out to danthonia. The only buildings consisted of a 4-roomed house and one farm building, a stable. Water for stock was pumped into troughs by four windmills.

Though handicapped at the outset by lack of adequate capital and the effects of a severe war disability, the present owner set out, with the help of one employee and plenty of confidence, to make a success of his venture.



Location of farm described in this article.

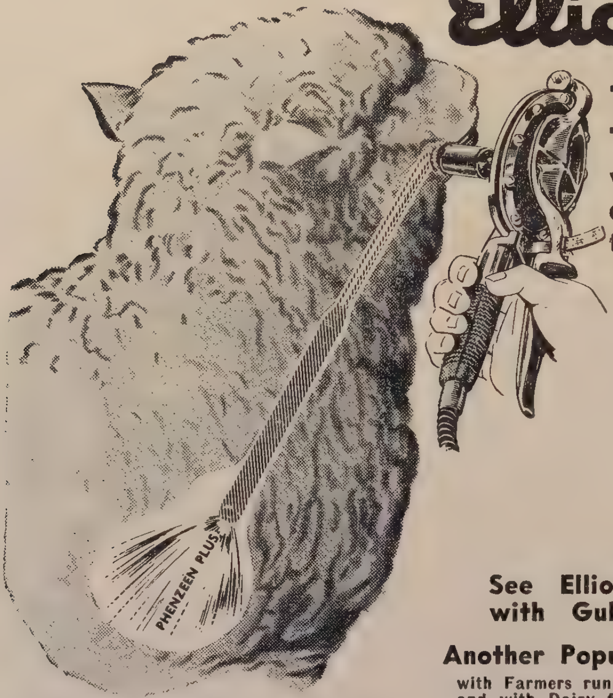
Pastures

One of the most important features of the improvement policy has been the establishment of pastures of lucerne and lucerne-cocksfoot. These pastures, permanent and resistant to grass-grub attack and providing good grazing when growth from other swards is at a standstill, have given outstanding results.

Lucerne

At the outset the new owner decided to grow lucerne, and 25 acres ploughed during the winter of 1944 were sown to lucerne in the following autumn. Though attacked by

Part of the North Canterbury farm the development of which is described in this article.



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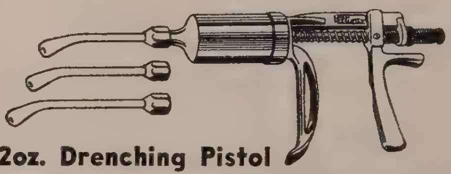

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2.2C

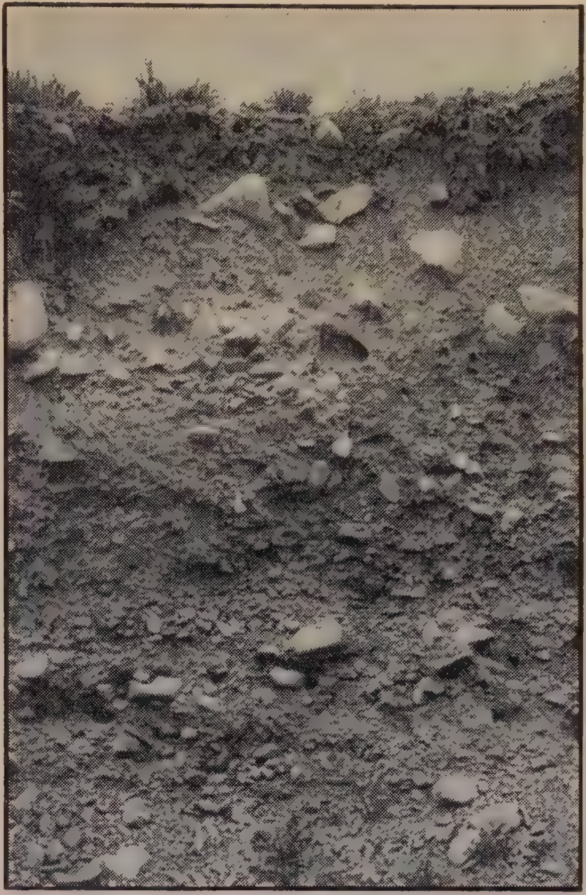
grass-grub in its early stage, this original stand established well and remains in good heart. It is being used for grazing and in addition at least one hay cut has been taken off it each year.

The initial success with this crop led to new areas being sown and to date 112 acres of lucerne have been established.

Lucerne is sown in spring either after a long fallow from December to the following spring or after a rape crop. When the latter method is employed the rape stubble land, after a second "feed off", is prepared with two or three strokes of a grubber and inoculated lucerne seed is drilled in 7in. rows at 10lb. per acre during mid-September, when spring growth has begun in earnest. Reverted superphosphate at 3cwt. per acre is drilled with the seed. Under normal weather conditions the establishing stand then has a full growing season before it. Three months after sowing the soil is consolidated and surface stones buried by heavy rolling. The lucerne is topped in autumn and goes into its first winter firmly established.

Once established, lucerne areas are used for haying and grazing and, except for the first year or two, when the lucerne acreage was small, all hay requirements have been produced on the farm. Though each area, in view of its additional use for grazing, can be expected to provide only one cut of hay per annum, two and even three cuts are sometimes taken. In exceptionally favourable years as many as four cuts at monthly intervals have been achieved. As a safeguard against possible seasonal limitations to haymaking a reserve of at least 1000 bales of hay is always carried forward from one season to the next.

The management of lucerne areas on this property has provided ample evidence that the crop can be grazed without undue prejudice to the maintenance of a vigorous, useful stand. Crops have withstood comparatively hard grazing over a period of years, provided always that the grazing has not been continuous. After being grazed the plants must be given time to recover and make good growth before being grazed again by stock. One of the advantages of lucerne as a pasture plant is that it recovers quickly after grazing when given the opportunity. After a shower fresh growth is soon available — much sooner than it is with perennial ryegrass. Spring growth begins on the winter-dormant stands by early August and this is usually sufficient to carry the ewe and lamb flock over until spring pasture growth comes away. When a backward spring or an early dry summer limits the feed supply no attempt is made to save lucerne hay. Instead the whole area of lucerne is used for grazing. The lambs then all go away fat and reserves of hay saved from the previous year are drawn on as required.



Profile, showing the thin layer of soil and the shingly and bouldery subsoil.

An area of lucerne ready for the first cut.

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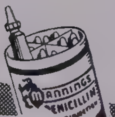

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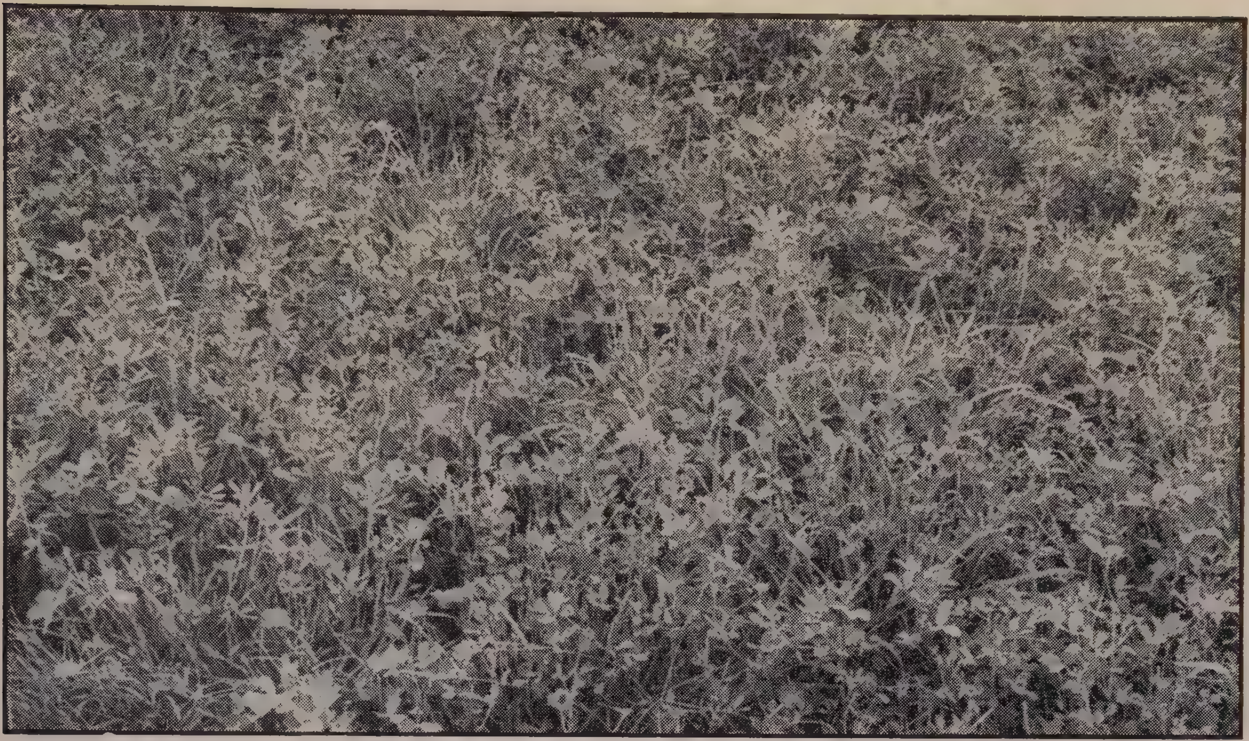

Lucerne-cocksfoot pasture. The seed mixture used is 10lb. of lucerne and 3lb. of cocksfoot per acre.

Lucerne and Cocksfoot

Three very desirable characteristics of a light-land pasture are:—

1. A long, useful life.
2. Resistance to grass-grub and porina attack.
3. Good production, especially in summer, when growth on the perennial ryegrass - subterranean clover-white clover areas fails to meet stock requirements.

These virtues are all possessed by the 60 acres of lucerne-cocksfoot pastures established successfully on this farm and which have played such a prominent part in raising productivity and stock numbers. Such pastures tend to become grass dominant in their third season because of the cocksfoot's continued growth through winter, when lucerne is dormant.

To restore a good balance of lucerne and cocksfoot the areas are closed in early autumn and the feed kept for the flock in July. This management provides the ewes with a green bite for the month before lambing, and close grazing at this time tends to suppress cocksfoot and allows lucerne to make vigorous growth in early spring.

Though it is generally accepted that lucerne produces better and lasts longer when mown every season, the lucerne-cocksfoot pastures on this farm have never been mown; yet the lucerne is still growing strongly. If the lucerne should go out, a good stand of cocksfoot, into which subterranean clover could be introduced by surface sowing, would remain.

The method of establishing lucerne and cocksfoot is very similar to that adopted for lucerne. Seed (10lb. of lucerne per acre and 3lb. of cocksfoot) is drilled in September on a seed-bed prepared after a rape crop or after a long fallow. Spring rains and favourable growing conditions usually ensure satisfactory establishment and vigorous growth of the young plants.

In their first autumn the lucerne-cocksfoot areas are lightly grazed with ewe hoggets. The heavy roller is then used and the area kept closed to stock until the following spring to allow the cocksfoot to become firmly established.

It has been the practice to sow the lucerne and the lucerne-cocksfoot pastures on the more shingly paddocks to reduce the costs of cultivation that would be involved if short-term species were sown. The better and more easily worked paddocks can then be used for perennial ryegrass and white clover.

Cocksfoot, Subterranean and White Clovers

Cocksfoot has also been sown with subterranean and white clovers. It invariably establishes well and with the clovers builds up a pasture that has a very useful place on this property. Cocksfoot makes good growth in autumn and provides feed that is usually kept for winter use. In early summer if conditions are favourable it provides valuable grazing when perennial ryegrass has gone to seed.

Both the clovers produce well in spring and again after the autumn rains. Once it is firmly established subterranean clover remains in the pasture indefinitely, helping all the time to build up soil fertility. It recovers well after grass-grub attack.

Pastures of cocksfoot and subterranean and white clovers are sown in autumn on well-fallowed land. Drilling is usually done during the last 2 weeks of February so that the young plants can become firmly established before growth is checked by early frosts. The seed (6lb. of cocksfoot, 3lb. of subterranean clover, and 2lb. of white clover) is lightly drilled in, which is the usual practice on this farm. These pastures, which now total 80 acres, are only lightly grazed in the first year to allow the cocksfoot to make good growth. For a time in late spring they are closed to stock to allow the subterranean clover to flower freely and set the maximum amount of seed.

Perennial Ryegrass, Subterranean and White Clovers

A large area (620 acres) is sown with perennial ryegrass, subterranean clover, and white clover. Though grass-grub may take the grass, the useful life of these pastures can be extended by drilling in more ryegrass. The successful establishment of autumn-sown pastures on this property is largely the result of long and thorough soil preparation. Three methods are employed, any of which will ensure good establishment. The methods used depend on circumstances, weather conditions, and the extent of the area to be dealt with. Factors such as the labour available and the extent of grass-grub damage have to be considered.

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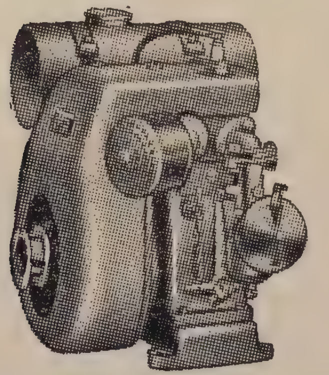

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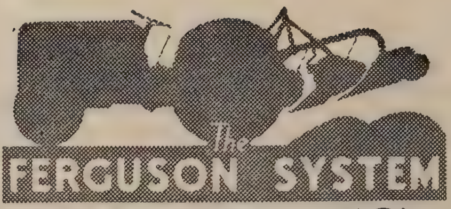

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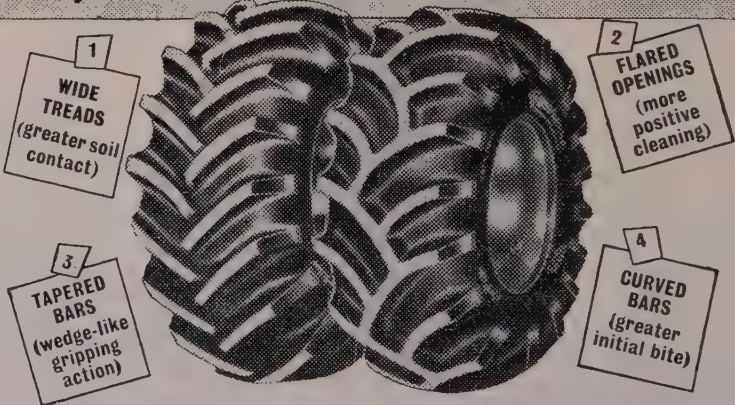

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Pasture established from a mixture of cocksfoot, subterranean clover, and white clover.

One method is to plough the land in May or June, work it well in spring, and then sow down in autumn. The second way is to plough the area to be renewed early in May and leave it up to the winter weather, work the ground well in spring, and then sow rape. When the rape is finished the ground is cultivated and the pasture mixture sown in autumn. The third method of establishing the perennial ryegrass-subterranean clover-white clover pastures—one that has proved most satisfactory—is to use the second-growth rape in winter as greenfeed, work the ground in spring, and sow down in early autumn. The seed is always drilled, not broadcast, as a better and surer strike is secured when the seed is placed with the fertiliser in moist soil than when it is broadcast and harrowed in. One bushel of Certified perennial ryegrass and 2lb. each of subterranean clover and white clover per acre form the mixture for these swards. In the following spring the young pasture is closed when the subterranean clover is flowering.

Topdressing

One ton of lime is applied before lucerne or pasture is sown and subsequent dressings are made as required. Lime is used freely and it would thus be possible to curtail expenditure in this direction should returns drop owing to a fall in prices. Approximately half the farm is topdressed each year with superphosphate at 1cwt. per acre.

Grass-grub

The owner intends to increase the area of lucerne and lucerne-cocksfoot pasture. In the meantime he realises that grass-grub can still put him in a tight corner, after which a lot of leeway has to be made up. D.D.T.-treated superphosphate is now applied to all affected areas and in future as an insurance against further loss this treatment will always be employed when pastures are being renewed.

Flock Management

When the present owner purchased the property 8 years ago 550 ewes were being carried. Since then, as a result of the establishment of better pastures and those that provide summer grazing, stock numbers have gradually increased. The flock now consists of 400 ewe hoggets and 1300 ewes—all Corriedales—350 or about one quarter of which are 2-tooths.

For 4 years Southdown rams were used with the whole flock and all lambs were fattened. Two-tooths were bought each year to replace culled ewes and in addition as the carrying capacity of the farm increased older ewes were purchased to increase stock numbers. To build up a flock of ewes that had all been bred on the property a change in flock management was made 3 years ago. Corriedale rams were used with three-quarters of the flock and all the ewe lambs retained to provide the 2-tooths required for replacements. The remainder of the flock is mated with Southdown rams and all the Down-cross lambs are fattened.

Each year with the larger areas of lucerne and of lucerne-cocksfoot more sheep have been carried. Although weather conditions have not always been favourable, there has always been sufficient hay and pasture growth available for the flock and all additional stock. Last year 200 wether lambs that had not been fattened were carried through the winter and then shorn and sold.

Because it has been possible to carry more sheep each year, ewes have been retained longer than they would normally be. When the home-bred flock is fully established surplus ewes will be disposed of as 5-year-olds. Deaths among the ewes have been low—on the average not more than 3 per cent. of the flock each year.

During a severe snowfall in 1945, however, losses were heavy, as with only a small area then in lucerne, hay supplies were short.

Lambing

The usual practice is to have the Down-cross lambs coming during the last week of July so that full advantage can be taken of the whole growing season. The lucerne is beginning to move in early August and this, together with the autumn-sown pastures, provides sufficient grazing for ewes with early lambs. As lambing proceeds the growth of lucerne keeps pace with requirements. The average percentage of lambs is 118. In one good year the percentage over the whole flock was 130. Last year in the flock mated with Southdown rams 150 per cent. of lambs were marked.

Seven years ago 650 lambs were produced on the property. Last year the total was 1500, and of these 400 ewe lambs were retained, 100 wether lambs held over, and 1000 fat lambs sold.

Shearing, Crutching, and Dipping

A woolshed holding 220 sheep and with a 2-stand electric plant was erected in 1946 and the existing sheep yards improved. The ewes are lightly crutched early in March and again just before lambing. Shearing of the main flock takes place in November. Early in December, after the first draft of lambs is away, the ewes with the Down-cross lambs are shorn.

Dipping is done in a neighbour's dip, an arrangement satisfactory to both parties. No sheep have been purchased for the last 3 years. No trouble has been experienced with foot-rot.

Cattle

The present owner believes that there is a definite place for cattle on this farm, the number required varying with the seasons. In the exceptionally wet season 2 years ago 40 cattle were required to dispose of surplus roughage. Last year was a

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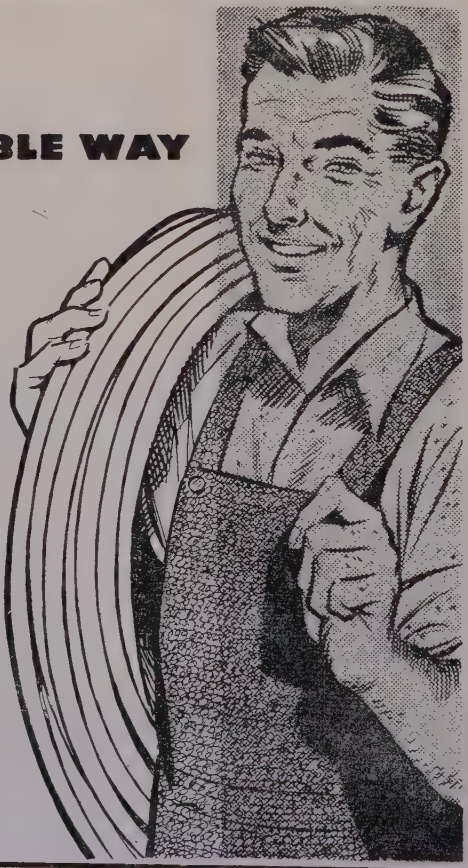

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dry one and only 14 head were needed. Cattle are bought in as required and disposed of once any surplus pasture growth has been consumed.

Forage Crops

Greenfeed Oats

No turnips have been grown, as they were not considered dependable for supplementary feed. For the first 3 years the stock were wintered on greenfeed and hay, 40 acres of Algerian oats being sown for greenfeed in the first year. As the result of a very favourable season the oats were allowed to go for a summer crop, part of which was cut for chaff. The remainder was threshed and yielded 50 bushels per acre, a surprisingly good return for this class of land. During the next 3 years no oats were sown, the autumn-sown ryegrass-subterranean clover-white clover pastures being used instead of greenfeed in winter and early spring. These pastures, however, cannot always be depended on at these times and even at their best they do not provide the bulk of feed that oats can produce. Last year, after the long dry period with little prospect of good growth on the newly sown pastures, 30 acres was sown to Algerian oats. They made remarkable growth and proved of great value in a season when the supply of feed was so limited. It is now realised that better production can be secured with greenfeed, and in future either Algerian oats or Italian ryegrass will always be provided as a safeguard for use in winter or a backward spring. Thirty-five acres of oats will be available this winter.

Rape

About 60 acres of old pasture is broken up and put into rape every year, and even on this light land the crops have always been reasonably good. Ground for rape is ploughed early in May to secure the benefits of a winter fallow. In spring it is well worked and left to settle down and conserve moisture. Drilling is done in the first week of October and in 2 months the rape is usually ready for the lambs. In a wet season it will not be mature then, but on the other hand the lambs would not need it. If dry conditions prevail, the Down-cross lambs are drafted at the end of November to get as many as possible away off their mothers. The remainder are weaned on to the rape and the ewes taken off the good feed. This relieves the feed position and leaves all the lucerne and lucerne-cocksfoot pastures for the ewes with Corriedale lambs. As a result these lambs come through in good condition and they in turn are then weaned and the wethers put on rape.

Hay

All hay produced on the farm comes off straight lucerne areas and sufficient is saved, approximately 3000 bales per annum, to meet requirements and to maintain a reserve of 1000 bales. When pasture growth dries off in early autumn it is the practice to feed any poor-quality hay that may be on hand to the ewes before the flushing season. This serves the twofold purpose of using up this hay and of conserving all available feed. Then, after the rams have been out, the ewes are returned to the poorer pastures, where sufficient hay is fed to enable them to hold condition. This makes it possible to close the better pastures and reserve growth for use at the leaner time of the year, when the ewes require better feed. A lot of grass is conserved in this way. The rule on this property is to plan always to have some feed in reserve for a critical time.

Pasture of perennial ryegrass, subterranean clover, and white clover that is typical of the large area of this pasture on the farm described.

The original stable building was converted into a hay shed capable of holding 500 bales. Two years ago the hay storage position was improved by the building of a Dutch barn with a capacity of 3000 bales.

Silage

Though the carrying capacity of the property has been greatly improved already, the owner is convinced that to achieve maximum production he must make silage. With the flush of spring growth the large area of young pastures (approximately 200 acres) is soon out of control. These pastures and the lucerne-cocksfoot areas too would be improved by the removal of the surplus growth which, as silage, could be kept in reserve. The owner is confident that by so doing present production could be increased considerably and that eventually it could be doubled. The drawback to the making of silage is the cost of the necessary equipment. Though this would be offset by increased returns, the owner is not yet in a position to incur this expenditure.

Water, Shelter, and Power

As there are no water-races or natural streams on the property, water has had to be provided and reticulated throughout the area. Seven windmills and two electric motors are used for pumping from bores, and when two more motors are working there will be water in each of the 29 paddocks.

Each year 1000 *Pinus radiata* trees have been planted for additional shelter belts. This rate of planting will be maintained for a few more years, as the value of shelter for stock and pastures is fully appreciated. Dry conditions one year were responsible for the loss of all the trees planted. The second lot planted in their place shared the same fate. However, at the third attempt the yearly quota of young trees was successfully established.

For the first 18 months the power unit was a 6-horse team. A light tractor then took its place. Three years ago this tractor was replaced by a 37 h.p. diesel machine.

Scope for Similar Development

Eight years ago at the time of its purchase this North Canterbury property was considered an uneconomic unit. By the renewal of run-out pastures and the use of lucerne, cocksfoot, and subterranean clover, together with liming and topdressing, the carrying capacity has been increased from approximately 0.5 ewe equivalents to 1.4 ewe equivalents per acre. Other factors contributing to the increase in production are:—

1. Early and thorough cultivation to ensure the successful establishment and vigorous growth of pastures.
2. The provision and maintenance of reserves of hay or pasture growth for critical times.
3. Sound stock and pasture management.

The land on this property is typical of a large number of farms in Canterbury. On many of these the same difficulties are encountered as those successfully overcome at Waipara. The practices adopted there could be followed with equal success on a number of light-land farms, and if this were done, the increase in their production and the resultant benefit to the Dominion as a whole would be considerable.

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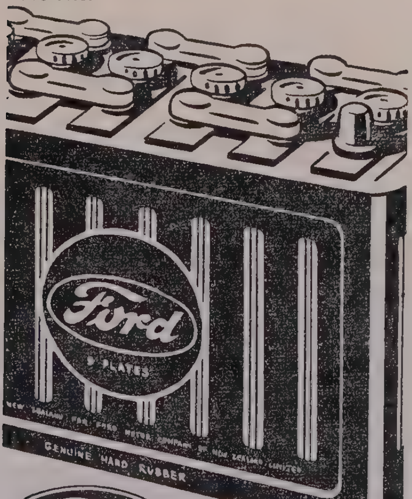

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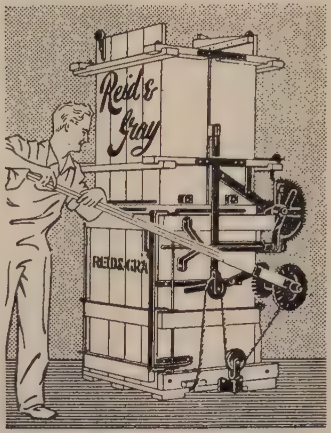

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The ordinary sheep louse has been particularly troublesome during the past year in many parts of New Zealand, but this pest can be dealt with easily and quickly by one efficient dipping. The Gammexane Powder Dips will definitely control lice, and will provide a reasonable period of post-dipping reinfestation protection, but, as with any dip, dipping must be carried out properly if good results are to be obtained. The main points to be remembered are:

1. A clean muster is essential. One lousy undipped sheep can quickly infest a whole flock.
2. The instructions on the packet must be followed exactly, especially those referring to replenishment and reinforcement.
3. Thoroughly wet each sheep. Dipping is an operation that cannot be hurried or speeded up, and each sheep must be allowed to remain in the dipping wash until saturation is complete. Do not delay dipping too long after shearing, because the longer the wool the more difficult it is to saturate the fleece.
4. Do not dip sheep in wash that has become excessively fouled. Clean out frequently and fill with fresh wash.
5. Do not allow dipped sheep to come into contact with undipped sheep, especially after the post-dipping protection period has passed.

If these five points are followed, control of lice is assured with Gammexane Powder Dips.

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BOX 599 - - - - - - - - AUCKLAND

Requeening a Hive of Bees

Seasonal Notes for the Domestic Beekeeper

By T. P. J. WILLIAMS, Apiary Instructor, Department of Agriculture, Hamilton

IF the bee colony is to gather the maximum crop of honey, there should be a large force of bees of the right age by the time the main honey flow begins. This may be attained only by having a young prolific queen at the head of the colony. It is essential, therefore, that domestic beekeepers make a practice of requeening each hive systematically.

A QUEEN bee heads each normal colony of bees, for without this all-important member no colony can survive. She is not the governing force of the colony, however, but is little more than an egg-laying machine. If she shows signs of failing in any respect, the bees will quickly replace her. However, the beekeeper cannot afford to let the hive do its own requeening, for in doing so they may rear several queens and cause the hive to throw off a number of swarms. In addition their new queen will probably not be purely mated and her offspring will be vicious and difficult to handle. The time lost from when the old queen ceases laying to when the new queen begins laying may result in the hive being too weak to gather honey.

Reasons for Requeening

The chief requirements of a queen are to be able to lay sufficient eggs and to produce offspring who are vigorous workers and an easy strain to handle. If either of these conditions is lacking, the queen should be replaced. Some colonies are prone to excessive swarming, and this may generally be remedied by introducing a new queen.

Requeening is an important factor in the treatment of certain bee diseases such as *Nosema apis*, bee paralysis, and sac-brood. Requeening is also necessary where colonies have become queenless. The queen may have died of old age or may have been accidentally killed by the beekeeper when he was working the hive. It is also possible for her to be balled and killed by the bees during spring because of robbing or untimely disturbance of the colony by the beekeeper.

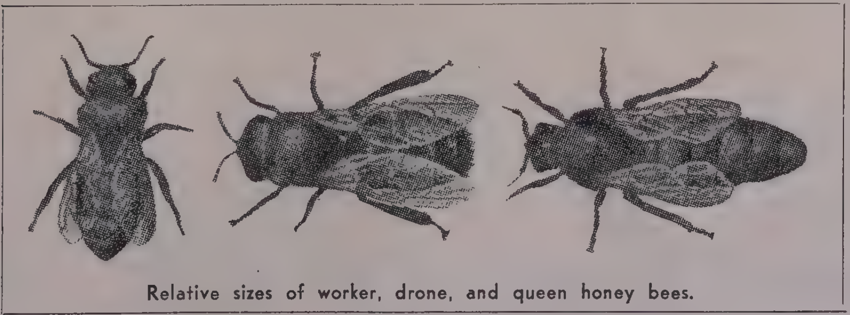
When the bees rear young queens in the course of natural supersedure they quite often fail to become mated. This is due to unfavourable weather or a scarcity of drones. These queens then become drone layers and eventually the colony dies out. Young queens may also be lost while taking their mating flights, and this usually results in the colony developing fertile workers. Unfortunately the eggs of these produce only drones and the colony perishes. If a colony possesses laying workers, it is usually difficult to requeen and should be united to another colony.

Finding the Queen

When it is desired to remove the queen from a colony the greatest difficulty for many domestic beekeepers appears to be to find the queen. Unfortunately it is necessary to remove the old queen before attempting to introduce another.

One method is to examine each comb separately, placing them in an empty super beside the hive. If all the combs and the inside walls and bottom board of the hive are examined and the queen has still not been found, each frame should again be examined and placed back in the hive. Frames should be handled gently and a very important point to remember is to use very little smoke or none at all.

As a last resort the queen may be found if the bees are sieved through a queen excluder. Tack a queen excluder to the bottom of a hive super and then nail a 3in. x 1in. batten over the excluder along one side flush with the edge and running the full length of the hive. Remove the hive of bees from its bottom board and place it to one side. Put an empty super on the bottom board and place on this the super with excluder and batten attached so that the batten overlaps the bottom box and leaves a gap 3in. wide on the opposite side. This gap should be nearest to where the operator is standing. Remove the outside comb (frame) from the hive and shake all the bees off into the top super with excluder attached, then put the frame down through the opening into the super below and push it over below the excluder, doing the same with each comb until all of the bees have been shaken into the top super. With the use of a little smoke these bees are then forced down through the excluder on to the combs below. The queen and the drones, having larger bodies than worker bees (see illustration below) are unable to get through the excluder and the queen may be found trying to force her way through the excluder. She should then be removed and may be placed in a nucleus hive until it is certain that the hive has accepted a new queen.


Relative sizes of worker, drone, and queen honey bees.

A simple method of introducing the queen without disturbing the bees. The hole in the mat is cut so that the flap falls back into place after the cage is removed.

Introducing a Queen

The introduction of a new queen to a colony is sometimes very difficult, as for example when there is a dearth of nectar. It is then necessary to feed the colony a solution of sugar syrup. Where a colony has been dequeened for only a few hours a new queen is usually readily accepted. If the colony has been queenless for a few days, it will be necessary to destroy all queen cells that may be started before introduction. The longer a colony is left queenless the less likely are the bees to accept a new queen. Other conditions affecting the introduction are when the hive is being attacked by robber bees and when the bees are out of food.

There are several methods of introducing the queen to the colony, the safest of which is the use of a queen cage. The queen is placed in a cage with a few attendant bees and the outlet is filled with candy. The cage is placed in the brood nest between two combs of brood and is held in position by the combs being pressed against it. The cage could also be placed on top of the frames and over the brood nest. The queen is confined in the cage until the bees have removed all of the candy blocking the outlet. This confinement allows the queen to acquire the colony odour and she becomes acquainted with the bees through the wire gauze. After the cage containing the queen has been placed in the hive the beekeeper should refrain from examining or disturbing the hive in any way for at least a week except quietly to check whether the queen has been released from the cage after 2 or 3 days; otherwise the bees are liable to ball the queen and kill her.

There are commercial queen breeders from whom good Italian queens may be purchased, and further information regarding them may be obtained from the local Apiary Instructor.

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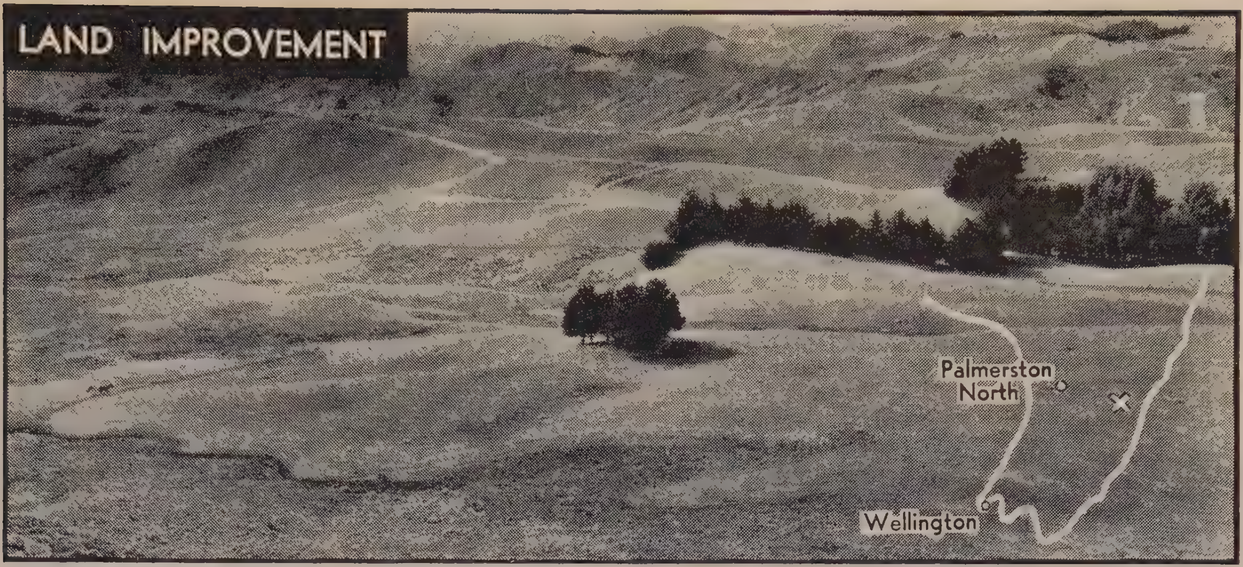

HEADING PHOTOGRAPH: Part of Mr. G. Pim's farm, which is typical of much of the hill country in the Pongaroa district. The location of the farm is shown by the cross on the map.

Carrying Capacity Doubled on Wellington East Coast Hill Country Farm

ONLY small, and in some parts negligible, increases in stock numbers have occurred along the hill country of the east coast of the North Island from Cook Strait to East Cape since the end of the Second World War. One farmer, however, who took over 609 acres of poor pastures in this area in 1947 has already, by clearing, oversowing, cultivating, and sowing, doubled his carrying capacity and improved his wool return per acre by 50 per cent. His example, and that of some others in the same region who are carrying out major improvements on their properties, indicates the possibilities on much of this country.

THE salient features of the improvement programme adopted by Mr. G. Pim on his property at Pongaroa, some 35 miles south-east of Dannevirke, and the results he has achieved are discussed in this article by L. Alsop, Fields Instructor, Department of Agriculture, Dannevirke, and R. H. Scott, Land Utilisation Officer, Department of Agriculture, Wellington.

About 65 per cent. of the farm can be disced, but the balance comprises steeper faces where improvement can be achieved only by oversowing and topdressing.

Pastures on the property in 1947 were dominantly browntop with rushes in the hollows, and there were considerable areas of manuka. The farm then carried 750 poor ewes and 78 cattle.

Improvement Programme

Clearing of the manuka was the first task. In 1948 oversowing and topdressing were begun, much of it being done by hand.

Up to June 1953, 400 acres or two-thirds of the farm had been oversown with 2lb. of white clover and 2lb. of subterranean clover per acre. Most of the paddocks have received at least 8cwt. of superphosphate since 1948.

Access tracks were made to enable seed and fertiliser to be taken on to the paddocks. Ten dams for stock water have also been constructed and it is intended to build more.

To hasten development of the property the first cultivation was done during the 1951-52 season. As the owner has no tractor, a contractor had to be engaged.

To prepare a paddock tree stumps had to be removed with a tracklaying tractor with a blade. This was followed by giant discing. Then the clods were broken down and undulations filled in with a ½-ton leveller.

This work was done in June 1951 and in December of that year 25 acres were sown in chou moellier for winter feed.

Two paddocks of 55 acres lay fallow until April 1952, when they were again giant disced, harrowed, and sown to a Certified ryegrass-clover pasture mixture at 44lb. per acre.

At the sowing down 3cwt. of superphosphate and 1 ton of lime per acre were applied.

The two paddocks of new pasture have established very well and they are carrying equivalent to 4 ewes per acre against about 3 ewes for the best of the other paddocks.

During the 1952-53 season it was intended to sow another 50 acres in grass, but owing to the very wet weather in the district in the late summer and autumn this became impossible and the programme has been delayed 12 months.

Though the intended development is not completed, the following figures indicate results to date. (All stock have been converted to ewe equivalents.)

CARRYING CAPACITY AND WOOL PER ACRE

	Ewes	Wool lb.
1947	1.7	17
1949		21.7
1951	2.6	
1952	3.1	24.2

Surplus lambs have always been sold as stores, but during the 1952-53 season a very good draft of 128 fat lambs, the first to go from this property, was sold.

It is intended to sow down a further 90 acres of pasture on the farm, which will give a total of about 146 acres of sown pasture. This should be done by the autumn of 1955, when the carrying capacity will have reached the equivalent of between 3.5 and 4.0 ewes per acre.

Problems

Development of hill country as it is being done by Mr. Pim requires the use of heavy equipment and reliance has to be placed on contractors. Very good work has been done by a contractor on this farm, but there are few contractors operating in these areas. It is therefore not always possible to have work done at the appropriate time and sometimes the results of pasture establishment are not what they should be.

A further problem and a real one for this farmer is that under the proposed development programme the limit of carrying capacity for a 1-man unit will be reached by 1955. To increase carrying capacity further will involve the provision of farm workers' accommodation, and in a relatively isolated area such as this only the provision of good married accommodation may solve the labour problem.

The necessity to provide additional accommodation can be a real retarding factor in reaching the full potential of a number of existing 1-man farm businesses of this type.

Care of Livestock during December

Contributed by the Animal Research Division

PIG PRODUCTION

FARROWED sows should receive a daily ration of 4 gallons of milk plus 2/3 gallon for each pig suckled. Newly weaned pigs should not be overfed; 1½ to 2 gallons per day in three feeds is adequate for the first 14 days. The ration can then be slowly raised to reach 2½ gallons at the end of the first month, and after the first fortnight the number of feeds can be reduced to two per day. Replacement breeding stock should be selected from the bacon pens, and only the fastest-growing sows with good strong feet and at least 12 well-placed teats should be chosen.

CARE OF EWES AND FAT LAMBS

As each lot of lambs is sold the mothers should be drafted off together with any dry ewes which may remain in the flock. If feed is short and the ewes have very little milk, it usually pays to wean all the lambs, which can then be given the best grazing available. The ewes should be shorn and those which are to be retained should be placed on short pasture with ample water. This will help to reduce their condition and will result in a better lambing percentage in the following season.

DAIRY COW NUTRITION

Dairy production for the year can be materially affected by feed conditions during summer. Cows fed poorly now not only produce less milk during summer, but will dry off earlier in autumn. Dairy statistics show that long lactation is very important, so the feeding of silage or other supplementary milk-producing fodders should be started as soon as pasture begins to dry off. It should never be left until milk production begins to show a material fall.

COWS RETURNING TO THE BULL

If cows are returning to service, the mating records should be examined to see if any particular bull is to blame. If this is so, it is wise to have a veterinarian or Livestock Instructor collect a semen sample for examination. Care is necessary when purchasing replacement bulls. If possible, a young bull that has not been used previously should be bought. A bull should never be bought in the saleyard unless his full history is known. Washing out cows seldom helps and may cause trouble if irritant fluids such as kerosene are used. It pays to consult a veterinarian as soon as the cows are noticed returning to service in unusual numbers. He cannot be expected to diagnose the trouble months later.

SHEARING

If ewes with lambs are to be shorn, every effort must be made to reduce the time lambs are away from the ewes, as it is easy to dry ewes off at this time of year. They should be brought to the shearing shed in small mobs and should be dagged before reaching the board.

FOOT-ROT CAN BE ERADICATED

Farmers who wish to eradicate foot-rot from their flocks should obtain a copy of Department of Agriculture Bulletin No. 325. This is the season in which the eradication campaign must be planned.

FOWL POX

So-called roup is often fowl pox. Specimens should be sent to the Department of Agriculture Animal Research Station, Wallaceville, for diagnosis. Outbreaks of this disease can be prevented by vaccination, of which full details may be obtained from the nearest Poultry Instructor.

Heading photograph by B. Snowden.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during September and for the 2 months ended 30 September 1953, with comparative figures for the same month and 2-monthly period of 1952, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	Percentage inc. or dec.
September 1953	16,030	315	16,345	—
September 1952	16,413	284	16,697	—
Increase or decrease ..	—383	+31	—352	—2.108
2 months ended 30/9/53	25,458	433	25,891	—
2 months ended 30/9/52	25,352	389	25,741	—
Increase or decrease ..	+106	+44	+150	+0.582

Butter in store at 30 September 1953 was 8808 tons

CHEESE

Period	White	Tons Coloured	Total	Percentage inc. or dec.
September 1953	7,701	11	7,712	—
September 1952	7,539	7	7,546	—
Increase or decrease ..	+162	+4	+166	+2.199
2 months ended 30/9/53	9,351	18	9,369	—
2 months ended 30/9/52	8,882	7	8,889	—
Increase or decrease ..	+469	+11	+480	+5.399

Cheese in store at 30 September 1953 was 4262 tons

If these figures are converted into butterfat equivalent, there is an increase of 1.231 per cent. in butterfat graded for the 2 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Haymaking and Harvesting Seed Crops

Seasonal Notes by the Extension Division

PREPARATIONS should now be made for the harvesting of hay from permanent pastures and of seed from ryegrass and white clover crops. The programme of making hay and silage on dairy farms should be integrated so that harvest work is spread and silage making exploited during early summer, when the weather is usually unsuitable for haymaking.

HAY HARVEST

FIELDS selected for hay crops should contain a high proportion of clovers and palatable grass to ensure a quality product. It costs as much to harvest a poor crop as to harvest a good one, and poor hay is worthless unless other more watery foods are in good supply. No matter how good the original material may be, the quality of the hay made from it is dependent on the care given in harvesting. Wind is the most efficient drying agent, as it reduces the moisture content rapidly without bleaching. If the weather is unsettled, turning of the swath should be delayed, as unturned material is less damaged by light rain. If, on the other hand, conditions are ideal, turning of the morning's cut may be carried out that afternoon or even sooner if temperatures are high. The crop may then be turned again or raked into light, fluffy windrows for maximum aeration during the 2 subsequent days. On the fourth day after cutting the swath turner or dump rake can be used to arrange the crop for stacking or baling. Overdrying and overhandling should be avoided, as these result in loss of valuable leaf, particularly in clovers. The use of the pick-up baler is now commonplace, but the drying operations must still be carried out as carefully as for material to be stacked.

—*J. R. ADAMS*

* * *

CUTTING RYEGRASS FOR SEED

BECAUSE "shaking" losses are feared, ryegrass seed crops, especially those of Italian and short-rotation ryegrasses, tend to be cut too early. Premature cutting causes "invisible" losses during subsequent threshing and machine dressing. Crops should be cut when the bulk of seed is mature and all traces of greenness have disappeared though little seed has fallen. A hat swept lightly through the crop or slight pressure on a bunch of heads held in the palm of the hand should remove seed readily. It is wiser to lose a little over-ripe seed than to sacrifice weight and quality of the main line by cutting too early. Before harvesting, all growers should take advantage of the Department's free "blind seed" testing service, which reports on disease incidence in relation to stage of crop maturity.

HARVESTING RYEGRASS SEED

Most ryegrass crops are windrowed, either with a mower fitted with an inside divider or with a binder with the tying mechanism removed. The size of the windrow should not exceed the capacity of the header. Binding and stooking is the most reliable method for handling Italian and short-rotation ryegrasses, but windrowing is frequently adopted to save time and labour. Losses may be materially reduced by making fairly narrow, even windrows that retain fallen seed and by operating the header at moderate forward speeds that lift the swath as one continuous, intact band. Normally perennial ryegrass is fit to thresh in 7 days after cutting, but Italian and short-rotation ryegrasses, which are both prone to heating, should lie twice as long in the swath. Drum speeds and settings vary with swath and weather conditions at time of threshing. Normally the concaves should be well open and the drum speed half that required for wheat.

—*L. W. BLACKMORE*

* * *

HARVESTING WHITE CLOVER

THE successful harvesting of white clover involves four important factors; grazing, time of closing, mowing, and harvesting. Areas intended for seed production should be fairly closely and evenly grazed during winter and spring. White clover seeds best in young pastures on land being raised in fertility. The pasture should be topdressed with from 1 to 3cwt. of superphosphate in autumn. If the land is fertile and growth is vigorous, the seed crop is difficult to manage except in districts of low summer rainfall. If growing conditions are favourable, grazing is usually continued into early November. A dry, cold spring calls for earlier closing. Normally grazing should continue until the first flower buds appear at ground level. In wet seasons it is difficult to prevent excessive leaf growth, whereas in dry seasons it is sometimes difficult to obtain sufficient growth to enable the header pick-up to lift the seed heads from the ground. Early closing is frequently more disastrous than delayed closing. Generally the crop is cut when three-quarters of the seed heads are ripe. Warm, dry weather is necessary for conditioning the swath for threshing. In wet weather if the crop has to lie in the swath even for a few days, subsequent growth will impede drying and the swath will have to be lifted with an aerator. Alternatively undercutting the second growth with the mower also will assist drying of a mature swath. Bright sunshine and a dry swath assist easy threshing, which is generally performed from the windrow. Once it is wet a heavy clover swath requires considerable drying, and each time the crop is handled seed heads are lost. In general, seasonal conditions have a large bearing on the growth, flowering, seed setting, and harvesting of white clover.

—*A. J. COUGHLAN*

* * *

VARIEGATED THISTLE

VARIEGATED thistle is effectively controlled by spraying with the amine salt of 2, 4-D. This non-volatile hormone weedkiller is marketed as "Stantox 64", "Weedar 77", and "Ataweed Concentrate", and any one of these materials applied at 1½ pints per acre (¾lb. of acid equivalent) gives a good kill of thistle. Where spraying is not practicable the hormone weedkiller can be applied in dust form, a suitable dust being the sodium salt of 2, 4-D, which is sold as "Phenoxone", "Frenokone", "Stantox 90", and "Economone". These materials are concentrated, 1½lb. (1lb. of acid equivalent) per acre of any one of them being sufficient for an acre of thistle. To facilitate spreading, the concentrated dust can be mixed with finely ground lime or fertiliser. The thistle should be treated from the seedling to the rosette stages (before it starts to shoot up into flower). To get rid of variegated thistle on any particular area takes several years, and once treatment is started it is essential to have an annual follow-up. Isolated plants should not be allowed to set seed, and attention should be paid to thickening up the grass cover. A good, thick sole of grass is the best insurance against variegated thistle. Oversowing with grass and clover species is often necessary, and it is particularly important not to overgraze in summer. Overgrazing lets the light into the soil and allows any dormant thistle seed to germinate with the autumn rains and reinfest the area.

—*A. A. DUNCAN*

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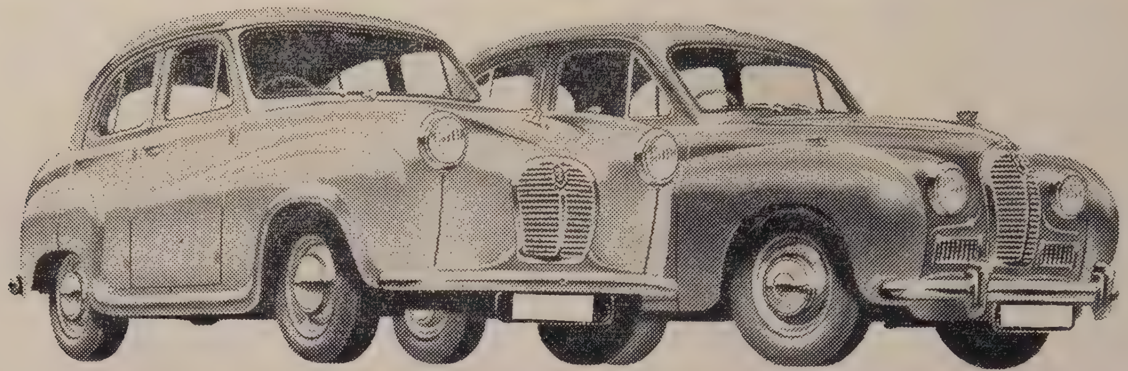

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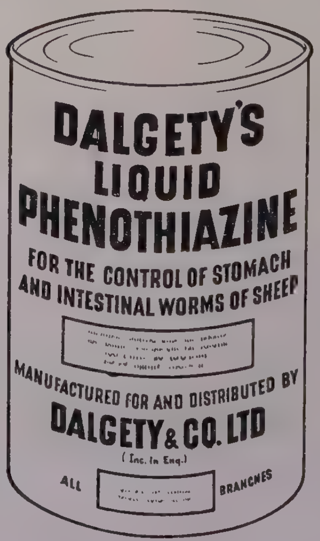
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Field Crop Competition in Gore District

Left—The winning swede crop yielded 66 tons per acre of a mixture of Grandmaster and Superlative varieties. Above—A break of the crop with the tops fed off.

FARMERS' field competitions have long been an important activity of the Extension Division of the Department of Agriculture. In earlier years annual crops featured largely in the programmes, but more recently pasture competitions have been more popular. In this short review of the Gore Agricultural and Pastoral Association's crop competition, which was judged in June, T. G. Sewell, Instructor in Agriculture, Department of Agriculture, Gore, indicates the local value of competition in fodder crop production. There were three classes—swedes, chou moellier, and yellow-fleshed turnips—and crops were entered from the Tuturau, Te Tipua, Waimumu, Pukerau, Waikaka, and Kaiwera districts. The standard was high and the large number of entries made the competition the most successful yet held.

THE winning entries for swedes yielded over 65 tons per acre, chou moellier 50 tons, and yellow-fleshed turnips over 40 tons per acre.

In the swede section the most popular variety was Grandmaster. A mixture of Grandmaster and Superlative was next in popularity, followed by Crimson King and Wilhelmsburger. One crop only of Calder swede was entered, and its yield of 54 tons and its quality compared very favourably with those of other varieties.

Cultivation for Swedes

For the entries placed first and second lea ground was ploughed in May, followed later by one harrowing on the furrow and two double discings, and the paddocks were rolled before sowing. The crops were ridged, 16oz. and 10 to 11oz. of seed respectively being sown at the end of November; 3 to 3½cwt. of turnip manure, part of which was borated for the control of brownheart, was sown with the seed. In both crops only one scuffling was necessary to control weeds.

The important features of this section as a whole were:—

First, that early ploughing considerably reduced the subsequent cultivation.

Second, that where borated manure had not been used brownheart was prevalent.

Third, that heavy liming before sowing the crop appeared to depress the effect of borax, and some brownheart was evident.

Left—The swede crop which was placed second was of the Superlative variety and yielded 63 tons per acre. Below—Part of the crop with the tops fed off.

The height of the winning crop of chou moellier, which yielded 50 tons per acre, can be estimated by comparing it with the height of the man standing in the crop.

Chou Moellier

The chou moellier crops were of the Giant variety. All the crops had been sown after swedes. The land was double disced up to four times in October, clod crushed, rolled, and ridged in November. Up to four scufflings were necessary for weed control.

The seed was ridged, 1 to 2lb. being sown with up to 4cwt. per acre of turnip manure. For the winning crop, which was grown on heavy land, 1lb. of seed per acre was sown. The crop was over 5ft. high and was being cut and fed to dairy cows.

Turnips

The two entries of yellow-fleshed turnips yielded approximately 40 tons per acre. Green Resistant was slightly heavier in yield than Purple Resistant and was a more even crop. The land had been ploughed after swedes in October, double disced, harrowed, rolled, and ridged in early December with 9oz. of seed and 3cwt. of turnip manure, including 1cwt. of borated manure. Only one scuffling was necessary.

Dry conditions and uneven germination after sowing were probably the cause of unevenness in many of the crops. However, most of the entries were fairly even and of good quality.

Value of Competitions

Field crop competitions are of considerable interest, as a number of ideas and opinions are expressed on the relative merits of varying cultural practices. For the competitors to find out where their own methods differ from those of others and where their own methods can be improved is of considerable value and helps to raise the general standard of crops in the district. The Gore Agricultural and Pastoral Association is to be congratulated for organising a very successful competition.

Chou Moellier and Swede Crops on Hill Country

In the higher-rainfall districts the taking of chou moellier and swede crops is a worthwhile practice in developing hill country, provided suitable areas are selected for cropping. The crops provide valuable winter feed and leave the land in good condition for resowing to grass. Ploughing is the most efficient means of preparing a seed-bed, but giant discs have also been used quite successfully on many hill-country areas. The initial ploughing or discing should take place well in advance of sowing to allow the turf to disintegrate completely and add its quota to soil fertility. The first cultivation should take place in early winter, after which the area should be exposed to the weather until late August or September. As soon as conditions permit the area should be worked down with discs, harrows, and roller until a fine and firm seed-bed is ready for sowing in October or November. Sometimes it may be considered desirable to use some form of leveller as well, and on very steep country it may not be possible to roll. The main point to keep in mind is that every operation should be carried out without haste and with the object of providing ample time for weathering and consolidation to proceed to a stage where both firmness and good tilth have been achieved.

Chou moellier and swede crop on the property of Hume brothers, Ohariu Valley, in hill country near Wellington.

Frequently these crops are sown mixed on hill country. When this is done swedes are sown at a usual seeding rate of 14oz. to 16oz. per acre and chou moellier at 5oz. to 10oz. per acre. This gives a full swede crop with a sprinkling of bulky, heavy-stemmed chou moellier which is not dense enough to provide harmful shading of the swedes.

Where chou moellier is sown alone the aim is to get a dense crop of thin-stemmed plants with much leaf. To achieve this the seeding is usually 3lb. to 4lb. per acre.

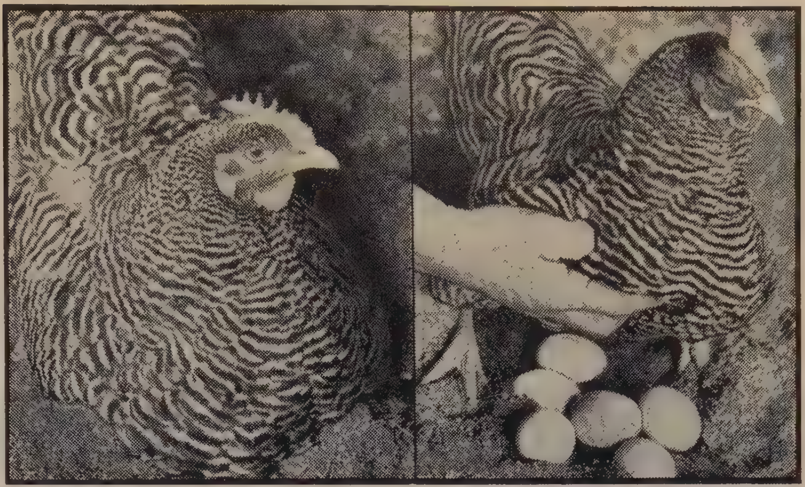
Both chou moellier and swedes respond well to fertiliser, and consequently it is advisable to sow 2cwt. to 4cwt. per acre with both crops. Reverted and serpentine superphosphate have proved quite satisfactory with both crops. Feeding off is best done in breaks so that full utilisation of whole crops is obtained.

—*J. M. HOPKINS,*
Instructor in Agriculture,
Department of Agriculture,
Levin

Natural Hatching in Household Poultry Flocks

NATURAL hatching still appeals to many backyard poultry keepers as a means of hatching a few chickens each year for replacement purposes. In this article for the household poultry keeper, H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, discusses the correct handling and management of broody hens.

LIGHT breed hens such as Leghorns seldom make good sitters and should not be used. Broodiness in most light breeds has been bred out over the years, with the result that any which may go broody will seldom see out the full 21 days. Consequently any attempt to sit the hen will usually result in her going off the cluck before the hatch is due and thus ruining a valuable setting of eggs. Most heavy breeds will prove satisfactory, but light Sussex, Buff Orpingtons, and Silver Wyandottes are particularly good. Of the commercial breeds the Rhode Island Red, Australorp, and crossbreds have proved satisfactory. Bantams make excellent sitters, but because of their size are seldom used except for pedigree work.



[Fraser Niederer

Heavy breeds usually make good broody birds for sitting purposes. This Barred Rock hen is sitting tight on a self-made nest and allows herself to be lifted off her eggs without attempting to run away.

Preparing the Nest

A correctly made nest is essential if success is to be achieved with natural hatching. More settings have been ruined through incorrectly made nests than by any other means. A very deep nest will usually result in the eggs piling up on each other, and through their not being able to spread out they will be broken when the hen stands on them. The nest should be saucer shaped to permit the eggs to spread slightly when trodden on and to prevent them from rolling into corners. A box 15in. square, 12in. high, and with the bottom removed will make an excellent nest. An easily removable front with adequate ventilation holes should also be provided. An important point to remember is that the nesting box should be placed on the ground and not on a board or concrete floor. Through being placed on the ground moisture is permitted to rise up to the eggs and this assists hatching. In very dry weather it may be necessary to moisten the ground around the box.

Setting the Hen

When a suitable broody hen has been obtained she should be examined for lice. If any are found, they can be easily removed by dusting the hen with sodium fluoride. Care should be taken to ascertain that the bird is fully broody before placing eggs under her. A wise precaution is to place a few dummy eggs in the nest first and these can be replaced after 2 days with the setting. The average heavy breed hen will cover 12 to 14 eggs comfortably. Any endeavour to force more under her will probably result in one or more eggs becoming chilled each day. Large, heavy hens are inclined to be clumsy and pullets are not always reliable.

Management of Sitting Hen

A sitting hen requires to leave the nest daily after the first 24 hours and up to the time hatching starts. From then she should on no account be disturbed until the hatch is over. Any attempt by the poultry keeper to count the chickens or remove the egg shells may result in the hen squashing one or more chicks through shifting her feet.

The hen should be taken off the nest at the same time each day or left to come off at will. When removing a broody hen from her eggs lift the wings first to release any eggs which she may have tucked under them. Ten minutes will usually be sufficient time for her to remain off the nest, but some hens will occasionally remain off for 15 to 20 minutes without harm resulting to the hatch.

To prevent fouling of the nest and to maintain body-weight it is advisable to feed only grain to broody hens. Whole maize or mixed grain will be found excellent for this purpose. One feed per day is sufficient, and greens, grit, and fresh water should be readily available.

Free Bulletins for the Household Poultry Keeper

Nos.

- 239 Curd Feeding to Poultry.
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- 333 Leucosis of Poultry and Its Control.
- 336 Household Poultry Keeping.

The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

The eggs under the hen should be tested on the seventh day and all infertile ones removed. A strong torch can be used at night for testing eggs. The infertile egg will appear quite clear and the fertile one will have a dark centre with small blood vessels leading from it. After the hatch is completed all egg shells and unhatched eggs should be removed.

Care of Chickens

Probably the easiest and most satisfactory way of managing a broody hen with chickens is to confine her to a coop which can be moved on to fresh ground every few days. The ideal spot is on a lawn. Where cats are not a menace the coop can be constructed to permit the chicks to run in and out freely and at the same time confine the hen to the coop. This is easily done by building the front of the coop with slats set 3in. apart. After 2 weeks the slats can be removed and the hen permitted to take the chickens over fresh ground.

Feeding

The chickens should be fed on day-old or No. 1 chick grain for the first few days, after which both chick grain and No. 1 chick mash can be fed. It is advisable to feed the hen on whole maize to maintain her body-weight. This grain is far too large for the chickens to eat and can be fed in the coop quite safely for the first 2 weeks. To make chickens grow rapidly and feather quickly a fairly high protein diet is essential. No. 1 chicken mash, which contains 10 per cent. meat meal, should be fed and to this should be added 8 per cent. of skimmed milk powder. Milk is a first-class food for chickens or hens of any age.

Development of Tussock Grassland in Waihemo County

THE hilly, tussock-covered county of Waihemo in Otago Land District contains about a quarter of a million acres and extends inland from the coast in the vicinity of Palmerston for about 30 miles. About one-fifth of the county has, over the years, been ploughed, cropped, and sown down to pasture. The remaining four-fifths is still in tussock pasture, some of which is capable of improvement, but much of which is too steep for ploughing or cultivation. That there is great scope for increased production in the county has been demonstrated by the application by Mr. D. G. Matheson on his farm at Morrisons of modern methods which are described in this article by H. K. Edie, Fields Instructor, Department of Agriculture, Palmerston.

THE climate throughout Waihemo County is suitable for mixed farming. Variations in temperature are not as great as would be expected in an area where the altitude varies from sea level to 2400ft., because the whole county, even at its inland boundary, is fairly near the coast, with the result that a moderating influence is constantly being exercised by the proximity of the sea. One beneficial feature which affects all the county with an altitude of over 800ft. is the prevalence of heavy fogs which sweep inward from the sea, especially in spring and autumn, thus adding to the effective rainfall.

The rainfall varies to an appreciable extent within a range of only a few miles. The average annual rainfall at Palmerston (near the coast) is 25in., but at Dunback (8 miles inland) it is only 18in.; at Morrisons the average is 20in.

Although the rainfall is not as great as most farmers would like, the seasonal fall is favourable to farming, as two-thirds falls in spring and summer, and the period of low rainfall occurs in autumn and winter, when moisture is not so essential for farm production.

Soil and Vegetation

The soil throughout the county is a slightly leached silt loam developed under a lowland tussock vegetation growing on a parent material low in phosphate and lime.

In the unimproved state the vegetation consists mainly of snowgrass (*Danthonia flavescens*), blue tussock (*Poa colensoi*), blue wheatgrass (*Agropyron scabrum*), and hard tussock (*Festuca novae-zelandiae*). Over the years farming operations have modified the original vegetation considerably and plants such as Yorkshire fog, sweet vernal, browntop, and catsear are very common on much of the land. Except on the higher elevations the snowgrass is slowly disappearing, largely as the result of fires.

History of Farming

During the latter half of last century and the first few years of this century the main source of income of many of the farmers in the county was the growing of wheat and oats. As one of the main roads to the Central Otago goldfields passed through the county, there was a heavy demand for oaten chaff for the large number of horse-drawn wagons conveying stores to the goldfields, and much of the oats was grown on land with an altitude of over 1000ft. Most of this land, even in its virgin state, was low in phosphate and nitrogen, and a succession of cereal crops was sufficient to lower the fertility to such an extent that regrassing was often unsuccessful.

On the lower areas cropping with wheat was even more intense than the cropping with oats on the higher-altitude farms, and the fact that two flour mills were in operation in the vicinity of Palmerston shows how much dependence was placed on wheat growing for a source of income.

HEADING PHOTOGRAPH: Club root resistant rape is frequently used as a feeding-off crop after swedes or turnips. This second crop is valuable not only for the feed it produces, but for its part in building up fertility to a state where good pasture can be established.

Cropping depleted the soil and even after it had been shown that the fertility of the depleted soils could be restored many farmers were reluctant to bring any more virgin soil into cultivation. Most of this cropped-out land reverted to browntop, but if the methods of development discussed later were applied, these areas could in a few years be carrying 3 or 4 ewes per acre.

The main difference between the browntop areas and the virgin soil is the fact that the crumb structure had been destroyed in the cropped-out areas and the humus supply heavily depleted. This means that the browntop areas are more difficult to cultivate and bring to a good tilth in their first year of development.

At present crops occupy only a quarter of the area they did 40 years ago and consist mainly of a small area of wheat and oats, principally in the more fertile areas. Root crops such as turnips and swedes are grown, but not extensively, for the provision of winter feed.

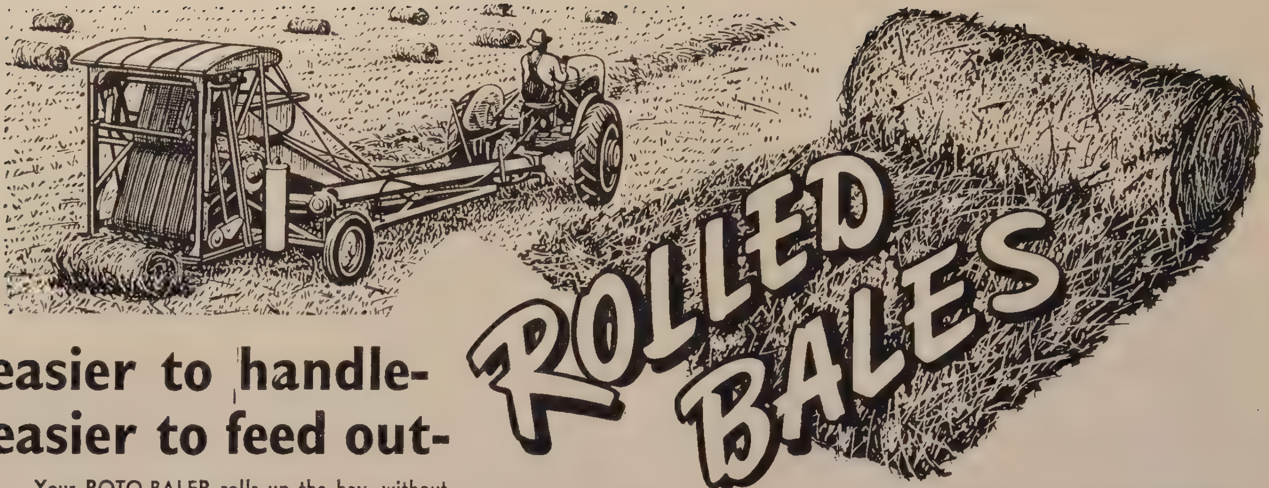
The over-all carrying capacity of the county is low, being approximately 1 ewe to 2 acres. On the unimproved land it is about 1 ewe plus replacements to 2½ acres. On the improved country the carrying capacity is better than 1 ewe per acre.

Morrisons Farm

Successful methods of improvement have been demonstrated by Mr. D. G. Matheson of Morrisons, which is about 20 miles from the coast, 1300ft. above sea level, and typical of an area of easy to steep hill country 20 miles long by 6 miles wide. The farm contains 880 acres and when Mr. Matheson took it over in 1937 it was carrying 500 ewes and 150 dry sheep. Now the farm carries 1140 ewes and 500

Above—Typical tussock grassland in Waihemo County. Much of this is ploughable and capable of being improved. Below—Digging out a wagon on the main road from Dunback to the Central Otago goldfields in the 1890s. At that time oats were grown widely in Waihemo County to supply feed for the large number of horse teams used in conveying stores to the goldfields.

[*Otago Early Settlers' Association*



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dry sheep with 500 to 1000 extra dry sheep during winter. There has been an increase of 140 in the ewe flock in the past 2 years, which suggests that the increase in carrying capacity is cumulative.

Since he took over the property Mr. Matheson has increased the area of sown pasture from 100 acres to 630 acres and the area is increasing each year.

Development Programme

In developing his unimproved land Mr. Matheson has found that 35 acres is the most convenient area to be brought in each year. The area may be varied according to the contour of the land and to reduce as much as possible the amount of fencing required.

Mr. Matheson makes a point of ploughing in February if possible, certainly not later than April. This is most important to ensure decomposition of the ploughed-in vegetation before the soil temperature falls too low in winter. A swamp plough turning a furrow 20in. wide by 6in. deep is used, as this is the minimum size of furrow which will ensure complete covering of the tussocks. If this early ploughing is carried out and a double cut of the discs is given in August, a good crop of swedes and turnips may be grown. After the first cultivation in spring lime at 30cwt. per acre is applied. The land is cultivated thoroughly throughout spring and 15 acres of swedes and turnips are sown in ridges in November and 20 acres sown unridged through the 14in. coulters of the grain drill.

When the swedes and turnips are sown 2cwt. of a proprietary turnip fertiliser mixture is sown per acre. The swedes are sown at the rate of 11oz. of seed per acre and the turnips at the rate of 10oz. per acre. This 35 acres of swedes and turnips, with 15 acres of kale which is sown on portion of the previous year's turnip ground, provides sufficient supplementary feed for the ewes and dry sheep.

Hillside of native tussock grassland which contains a considerable amount of introduced plants.

Lambs on club root resistant rape; some lambs are camping on unbroken tussock country (right), thereby transferring fertility from crop to native pasture on areas too steep or stony for cultivation.

Importance of Supplementary Feed

The importance of supplying supplementary winter feed in the form of root crops cannot, in Mr. Matheson's opinion, be over-emphasised, as spring growth is usually late, owing mainly to late frosts and to the light rainfall at this period. If sufficient supplementary feed is not provided to enable the pastures to be spelled during part of July and throughout August and, if possible, until the middle of September, the pastures are so closely grazed that recovery may be delayed even until November.

The balance of the previous year's swede and turnip area, approximately 20 acres, is sown in rape for fattening lambs. Last season Mr. Matheson drafted 50 per cent. of the lambs fat off their mothers, and the balance was fattened on the 20 acres of rape. The lambing percentage last season was 115, and there has been a gradual improvement in the lambing percentage over the period since Mr. Matheson took over the property from 95 per cent. in 1937 to 115 per cent. in 1951 and 1952.

Rape

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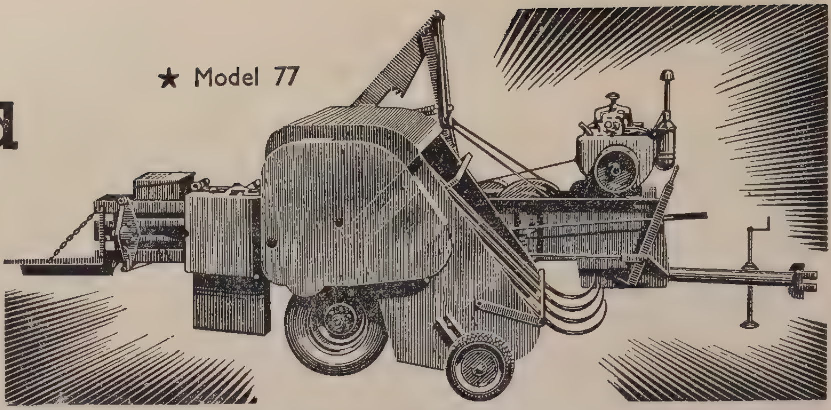

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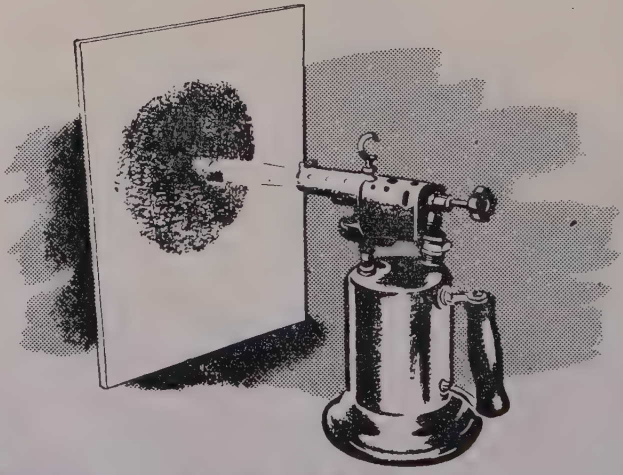

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14in. coulters of the grain drill with 2cwt. of phosphatic fertiliser. In preparation for crops of kale and rape after the original crop of swedes and turnips neither the plough nor the cultivator is used, as it has been found advisable to leave the ploughed-in organic matter undisturbed for a further 12 months to ensure complete decomposition. For this reason it has been found that the discs, the tine harrows, and the roller are the most suitable implements for preparing a seed-bed. The number of times that the ground has to be disced is determined by the extent to which the ground has been packed down hard after feeding off under wet conditions in winter.

Sowing to Pasture

In the next season's cultivation programme the area of rape and kale is ploughed and thoroughly worked before being sown down without any accompanying crop in late spring or early summer. Mr. Matheson does not attempt to sow any area down to pasture until two crops of supplementary feed have been grown and fed off on it, and the pasture is sown without any accompanying crop. There are two reasons for these practices. First, it is essential, if good establishment of the young pasture is to be obtained, that the fertility should be raised to a fairly high level before sowing, and second, in this area of low rainfall a great amount of damage can be done to a young pasture sown with rape, both through over-grazing the young pasture plants and through destroying the young plants with excessive trampling.

The pasture mixture sown consists of 20lb. of perennial ryegrass, 12lb. of cocksfoot, 2lb. of crested dogstail, 3lb. of white clover, and 3lb. of Montgomery red clover per acre. Except for the crested dogstail, only Certified seed is used.

The heavy seeding of cocksfoot with the crested dogstail is fully justified, as was proved 2 years ago when the oldest pasture on the farm was severely attacked by grass-grub and it was thought at the time that the sward was completely ruined. Today, however, there is quite a good pasture of cocksfoot and crested dogstail with a good bottom of white clover and Montgomery red clover.

In the spring after the sowing down of the new pasture the area is topdressed with 2cwt. of phosphatic fertiliser and 10cwt. of carbonate of lime. This topdressing is applied to all pastures every second year.

Spelling of Pastures

Another practice which is considered essential in the maintenance of good pastures is that of spelling between grazings. However, last season, owing to the fact that the main highway intersects the property and rotational grazing of the whole property would have entailed the shifting of 400 ewes with their lambs across the main highway every second week, the flock of 400 ewes with their lambs were grazed on two paddocks of 40 acres each, and the flock shifted from one paddock to the other every week. The flock was grazed on these two paddocks from lambing time until the lambs were drafted for the freezing works, when 50 per cent. were drafted as prime and the balance were fattened on rape.

Improved pastures can be satisfactorily established and maintained provided soil fertility is raised by the use of lime and phosphate.

Stock Management

As Southdown rams are used, all lambs are fattened, and it is the practice to buy in 2-tooth ewes each year. The hoggets grazed on the property are from another holding and are required for replacements there. The high cost of the 2-tooth ewes is, however, forcing Mr. Matheson to alter his management and in future he will be using sufficient Romney rams to enable him to breed his own replacements.

The rams are mated with the ewes, at the rate of 1 ram to 40 ewes, during the last week in April, so that lambing begins at approximately 20 September.

In addition to the increased carrying capacity and improved lambing percentage Mr. Matheson has had a large increase in weight of wool per sheep. In 1937 the weight of wool per sheep was only 7½lb.; today the average is 11lb. Needless to say, there were no milk lambs in 1937, but today 50 per cent. are drafted prime off their mothers.

Scope for Greater Production

The success achieved by Mr. Matheson cannot, however, be measured solely by numbers of sheep and weight of wool. There are the knowledge and satisfaction of having achieved a worthwhile task and of having been one of the pioneers in bringing to a high state of production land which in its unimproved state was not very promising. The peak of production on the property has not by any means been attained, because the effect of good soil and pasture management is cumulative, and an increase in carrying capacity may lead to a rise in fertility, thus making possible a further increase in carrying capacity.

From Mr. Matheson's experience and practice can be derived much that is applicable to the whole county, because it is disturbing that its production has declined over the past 20 years though many farmers have increased their incomes. The main lessons from Mr. Matheson's experience can be put into practice over a considerable area of Waihemo County with a resultant increase in carrying capacity.

Without sufficient fertilisers and lime very little progress can be made. In the vicinity of Morrisons the land requires about 30cwt. of lime per acre, although in some other parts twice this amount can be applied with advantage. It has been found that pastures should be sown down with at least 2cwt. of superphosphate per acre and that they should be topdressed at least every other year with 2cwt. of superphosphate and 10cwt. of lime.

Provision of supplementary winter feed is essential not only for the well-being of the sheep, but to enable pastures to be spelled during winter.

Production in Waihemo County could be increased very considerably if the methods adopted by Mr. Matheson were applied not only to the 76,000 acres of unimproved land in the county but to the large area of formerly cultivated land which has reverted to browntop.

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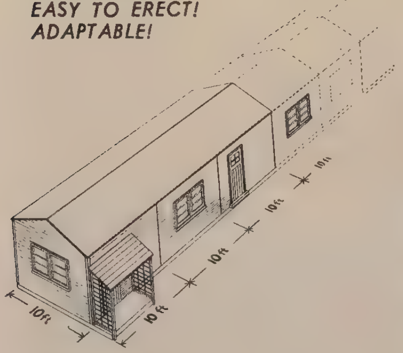

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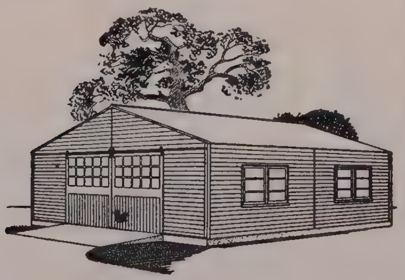

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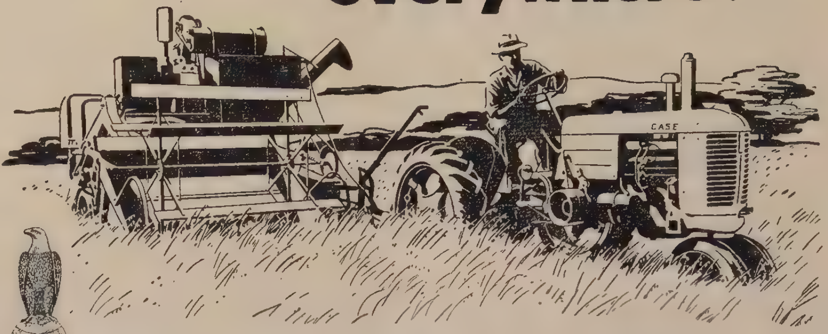

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Effect of Dampness on Bees and Apiary Equipment

THE tendency for many beekeepers to select apiary sites that are well sheltered from wind and to fence them off from stock, thus allowing grass to grow long, can cause hives to be affected by severe and persistent damp, which is dangerous to bees. Cold, damp conditions in an apiary, especially in early winter, can have a detrimental effect not only on the health of the bees but on bee combs and honey. In this article L. H. Johnson, Apiary Instructor, Department of Agriculture, Palmerston North, describes the effect of damp on hives and bees and advises on methods of avoiding the conditions which cause damp.

THE annual rainfall certainly plays a major part in promoting dampness in an apiary, but it is by no means the sole reason, as dampness is rather the result of a combination of circumstances. Experience has shown that beehives in very heavy rainfall areas need not suffer from dampness. The duration or the amount of rain does not count as much as the time taken for the area to dry out.

Apiary Sites

Because beekeepers usually select apiary sites in positions well sheltered from prevailing winds, damp may be much more persistent in an apiary than in most other places. Shelter can be overdone; there should be some movement of air to remove surface moisture.

How Moisture is Retained

Apiaries that are fenced in from stock usually become overgrown with grass and weeds. When the long grass and the ground become thoroughly saturated in late autumn damp may persist for several months. The retention of surface moisture is also aided by most native trees. Once the ground and the vegetation are thoroughly saturated they take a long time to dry out, especially when the soil is of an impervious nature. Condensation within the hive may make the centre of the hive mat quite damp.

Unsatisfactory Hive Material

Leaky hive roofs contribute largely to the dampness often found in hives.

A sheltered apiary site overgrown with grass and weeds where damp persists during winter and spring.

Floor boards that are a little low at the rear will allow water which falls on the front projections to seep through to the back and wet every inch of the floor boards.

Quite commonly a hive body with bees may be lifted off the floor board to reveal hundreds of bees drowned in water less than an inch deep. Masses of wet dead bees can cause a foul odour which will permeate the whole hive.

Effect on Health of Bees

Bees require warm, dry living quarters to maintain healthful vigour. If hive conditions are right, bees will live for 3 or 4 months in winter and early spring.

The floor of a hive is usually 6in. or less from the ground, and the cluster of bees in a single-storeyed hive is about a foot off the soil.

When the temperature drops and the atmosphere surrounding the colony is charged with moisture which is further intensified by a damp hive mat the bees must go into a tight cluster to survive.

Should the bees get wet because of a leaky hive roof, the whole colony will perish in a few hours.

A cold, dry atmosphere is not so detrimental as combined cold and damp, which will permeate the whole hive and chill the cluster of bees. When these conditions persist bees will become very sluggish. With their health undermined and lacking stamina, numbers of bees die of some malady which has not been diagnosed as a specific disease.

In spring it is not uncommon to find bees in these cold, damp, sheltered apiaries affected with dysentery, with varying degrees of severity.

Other developments unfavourable to bee life also take place in a damp hive, such as the fermentation of any uncapped honey and the growth of moulds in pollen-filled combs.

Precautions and Remedies

A lot can be done to make hive conditions much more comfortable in winter and spring.

The first and major requirement is sound, good-fitting hive material. Hive roofs that are not watertight are very common. Flat roofs of the telescopic type covered with 26-gauge galvanised flat iron are thoroughly satisfactory provided that:—

First, the iron is cut sufficiently large to cover all the wood on the margin strips right to the bottom edge.

Second, the corners of the iron are not cut, but are folded in such a manner that no water will lodge.

Third, galvanised clouts are driven through the iron on the face of the margin strips near the bottom edges; on no account should they be driven through the top of the roof.

All supers should be made to an exact standard and so have no cracks or draughty holes.

Floor boards should be on a firm foundation and so adjusted that the front is ½in. lower than the back.

Supers with bee combs stored under *Pinus radiata* trees in cool, dry, and draughty conditions.

Upper—This apiary has abundant shelter on the south and the area is closely grazed by sheep, thus allowing sun and air to keep the surface of the ground fairly dry. Middle—An apiary without tree shelter and with no excess moisture problem. Lower—Hives set on stands in an unfenced apiary with sufficient shelter. The grass has been close grazed by stock and air can circulate under the hives.

Locations for Apiaries

In some localities it is not possible to find a really good apiary site and in others better positions could be obtained if more time were spent in searching for them and better judgment exercised in the final choice. Areas which are likely to become flooded either by a river, creek, or surface water should always be avoided.

In open pasture country where there are very few trees or hedges reasonably good apiary sites may be found by selecting positions where the contours of the land will deflect the prevailing wind. Apiaries in these places get all the sun and are usually dry.

Advantages of Unfenced Apiaries

Unfenced apiaries where stock are permitted to graze have no long, wet grass problem. Numbers of commercial beekeepers have found it quite practical to operate apiaries without fences.

To prevent cattle knocking hives over the hives should be arranged in pairs on stands or be placed in compact groups of threes with entrances in opposite directions. Hives are liable to be upset by stock seeking shelter if the apiary is placed near the only group of trees in the paddock.

Hives Protected by Trees

Though much attention has been drawn to draughty, damp apiary sites under trees, some trees can provide satisfactory shelter. It is essential that the lower branches or other undergrowth should effectively prevent ground draught. Hives may be placed on the northern side under totaras, birch, macrocarpa, or *Pinus radiata* trees where they will be protected from showers of rain, cold wind, heavy dews, and frost, but will also get the benefit of the sun. Grass and weeds cannot compete with the litter of pine needles. The surface of the ground and the surroundings are usually comparatively dry.

Colonies of bees in these tree-sheltered apiaries have come through winter in a dry, healthy, and vigorous condition.

Storage of Bee Combs

Wax moth will attack bee combs if the combs are stored in a closed building where the temperatures remain fairly mild.

Combs should be spaced out to eight in each super and stored in a dry, cool, draughty place. A building may be designed and built for this purpose.

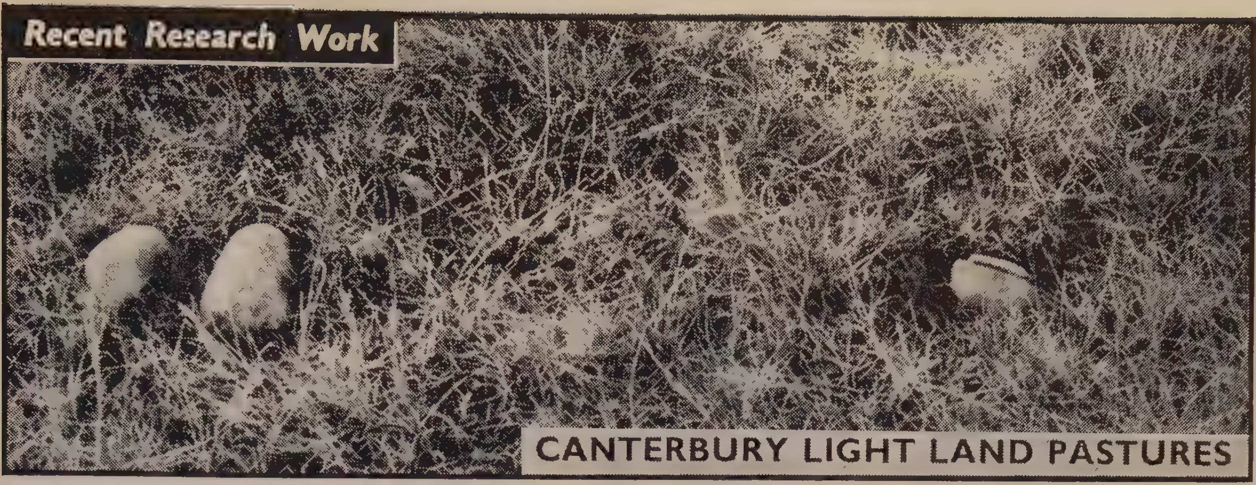
As an alternative to a building, good use can be made of a plantation of *Pinus radiata* where ideal conditions are maintained. The warmth of the sun will not penetrate the foliage and the amount of air movement permitted will keep all the equipment dry and cool.

Place 4in. x 2in. runners on the ground 16in. apart. Set queen excluders on these, then tier up with supers of combs. On top lay sheets of corrugated iron. This arrangement will keep rats and mice out and will also be unfavourable for establishment of the wax moth.

Combs will remain fresh and sweet without any odour of fermentation.

Recent Research Work

CANTERBURY LIGHT LAND PASTURES



HEADING PHOTOGRAPH: Typical poor pasture on light plains land.

THE light lands of Canterbury extend over an area of approximately 600,000 acres, and the outstanding problem in the farming of this type of country is the tendency for newly sown pastures to revert rapidly to low-producing species. The devastating effects on pasture of severe drought and grass-grub attack are a constant threat, though recent research has reduced the latter danger immensely. In the development of light land there are two major considerations, namely, the raising of soil fertility and the provision of drought-resistant pastures, both of which are aimed at reducing the moisture deficiency which so cripples the stock-carrying capacity on this type of land. Every endeavour must be made to extend the useful life of pastures and so reduce the detrimental over-cultivation of light land. Adequate topdressing programmes are therefore essential, and lime and phosphates are necessary in regular dressings.

SOUTH CANTERBURY TRIALS

TO obtain a guide on suitable species and mixtures for light land a series of 7 experimental plot trials has been carried out since 1948 in South Canterbury. Well over 100 plots have been sown and all types of general-purpose and special-purpose mixtures have been used in these trials on 7 individual farms from Glenavy in the south to Orton in the north. With these trials pasture management methods have also been studied and considerable information obtained on both the establishment and production of these mixtures. Species studied in these trials, apart from the common pasture species, include *Phalaris tuberosa*, perennial veldt grass, tall oat-grass, meadow fescue, sheep's burnet, chicory, sainfoin species, *Lotus corniculatus*, alsike, sweet clover, strawberry clover, and Tallarook and Mt. Barker subterranean clovers.

PERENNIAL RYEGRASS

For feed production, especially in the initial stages, a standard ryegrass mixture cannot be bettered, but on light land it is essential to include a very liberal sowing of clovers to maintain all-the-year-round production and give adequate ground cover to reduce frost lift in winter and desiccation during the dry summer and autumn. A suitable mixture for a standard ryegrass pasture is:—

	lb.		lb.
Perennial ryegrass .. (or perennial 15lb., short-rotation 10lb.)	25	Montgomery red clover	3
		White clover	2
Dogstail	1-2	Subterranean clover ..	2-4

Even with protection against grass-grub this pasture has a limited life owing to the short productive life of the ryegrasses under low-fertility conditions and the ingress of browntop, sweet vernal, hairgrass, and danthonia. In the experimental plots and in general practice it has been found that the inclusion of 3 to 4lb. of cocksfoot has little advantage, as the survival of cocksfoot under the grazing management for ryegrass pasture is poor.

COCKSFOOT

To extend the life of the pasture and provide a green bite in the summer cocksfoot should form the basis of the mixture on a considerable portion of a farm. Successful establishment of cocksfoot hinges on reducing the competition from, or totally excluding, the ryegrasses and guarding against heavy stocking during the initial establishment period. Here again vigorous clovers should be included to sweeten the cocksfoot pasture and provide a dense bottom to the tufted grass. A good mixture for a cocksfoot pasture is:—

	lb.		lb.
Cocksfoot	8-10	Subterranean clover ..	2-4
Dogstail	2	White clover	2
Montgomery red clover	3		

Perennial ryegrass at 5 to 10lb. may be included in the above mixture.

LUCERNE

Where lucerne can grow vigorously it is a most valuable asset both for providing hay and for light grazing. With better than average fertility conditions cocksfoot or *Phalaris tuberosa* combines well with lucerne, provided the seeding rate is below 5lb. per acre, but where the fertility is in doubt lucerne is best sown alone, as, when it is unthrifty, it cannot stand up to the competition from the grasses, especially the strongly tufted cocksfoot.

Suitable mixtures are 10 to 12lb. of lucerne and 3lb. of cocksfoot, or 10 to 12lb. of lucerne and 5lb. of *Phalaris tuberosa*.

SUBTERRANEAN CLOVER

The chief virtue of these trials has been the recognition subterranean clover has received as the main fertility builder under light land conditions and also the value of heavier sowings of up to 4lb. per acre when subterranean clover is first established on light land. Careful management of subterranean clover pastures is essential and unless lenient grazing during the early flowering period of October and November is carried out, the seed-bearing runners are not able to develop and the vigour of the stand in subsequent years is sacrificed. Total spelling during some part of the flowering period is advisable in new subterranean clover stands.

MANAGEMENT

The management of pastures on light land is much more important than it is under conditions of medium to high soil fertility. The advent of D.D.T. and "Gammexane", giving control of grass-grub and subterranean grass caterpillar (porina), has assisted markedly in prolonging the life of pastures. However, more attention needs to be paid to special-purpose mixtures and the management of existing pastures if carrying capacity is to be improved markedly. Sowing down pastures with turnips is often a necessary evil, but there is a marked swing toward sowing mixtures without turnips, and there is much to commend this practice. The drilling of pasture in 3½in. rows is a major development of great value on light land, as it gives greater separation of species in such mixtures as cocksfoot and lucerne than is secured when 7in. drills are used for sowing.

—*W. L. OSBORN*

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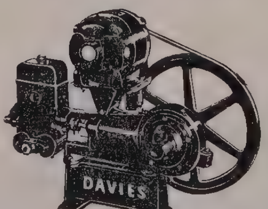

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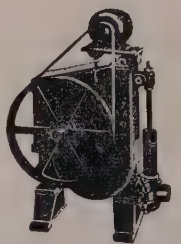

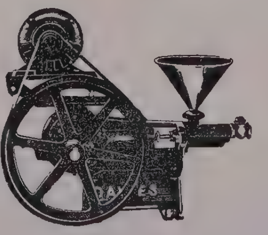

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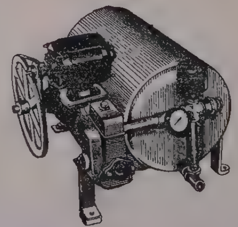

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The Home Orchard in Summer

THE amount of attention required by young or newly planted fruit trees is often not fully appreciated. Failure of many trees to produce satisfactory crops can often be traced to checks suffered during their early development. Maintenance of a developing orchard and points on spraying and routine work during the coming months are discussed in the following article by C. E. K. Fuller, Horticultural Instructor, Department of Agriculture, Hamilton.

YOUNG trees should be encouraged during their first few years to make strong growth and develop a sturdy framework of main branches capable of carrying good crops when they reach fruiting age.

To ensure that they attain the required growth the young trees and the conditions under which they are growing should be examined and measures should be taken to rectify unfavourable factors.

Watering

The young, developing tree should never be allowed to be short of water to the point where wilting occurs, for under these conditions growth stops and the wood hardens, and although growth is resumed when water is applied, the tree has been checked.

Frequent shallow watering is not desirable, as this encourages shallow rooting of the tree. On the other hand too much water may cause injury to the roots. The ideal lies half-way between the two. The water available to the tree should be sufficient to maintain steady growth, but each time water is applied it should be sufficient to moisten the soil to such a depth that as the surface dries the tree roots are encouraged to drive deeply to the supplies at lower levels.

Citrus trees need more water than deciduous fruit trees. Weekly watering may be needed in the hottest weather, but longer intervals may be allowed in early summer and autumn. Every attempt should be made to prevent water from lying round the trunks of citrus trees. All kinds of citrus are subject to attack from a fungous disease (*Phytophthora* spp.) commonly known as collar rot, or as root rot when it occurs below ground level. Excessive soil moisture at the bases of the trees provides conditions suitable for the development of this disease.

Staking and Tying

Although provision of support for the trees is best done at planting time, before the earth is filled in round the roots, it may not be found until later that support is necessary for the young trees. In particular, trees on East Malling IX dwarf stock, which have brittle root systems, require support until well established.

The stake should be long enough to reach the lowest branch when driven firmly into the ground. The trunk should be tied to the stake with soft cord after it has been wrapped with old felt or similar material to ensure that the cord will not cut into the bark. Ties should be left loose enough to allow normal growth. The cord should be checked annually. Stakes should be rounded so that they do not chafe the trees and should be placed on the windward side. The lower 2ft. of stakes should be treated with creosote or tar to reduce rotting.

Shelter from Wind

In exposed positions shelter from wind will aid rapid tree establishment. A simple hessian screen for the first year or two will greatly help young trees exposed to damaging winds, but a shelter hedge or trees should be established for the protection of the fruit trees when they come into cropping.

Summer Pruning

Summer pruning is not generally recommended. It reduces the leaf area responsible for building up food material for future growth and therefore tends to reduce growth in the following season. Unless trees are so vigorous that fruit production is reduced and a check is required, summer pruning is unnecessary.

Young trees are one exception, for if any leaders are found outstripping others, the dominant shoots may be pinched back to bring about an evenly balanced tree. In addition any undesirable shoots, such as those low on the trunk, may be removed, preferably during the first 10 to 14 weeks of growth.

Disease and Pest Control

A phase of management often neglected is the spraying of young fruit trees. All ailments of older trees may be contracted by young trees. Adherence to a spray schedule will aid in preventing infection, but it need not be as complete as for trees in full bearing. ("The Home Orchard in Spring" in the "Journal" of August 1953 gives spray programmes on page 125.)

Sprays are applied mainly to prevent rather than cure disease, and to achieve this it is necessary to spray thoroughly with the correct materials at the right time.

During the growing season the foliage or fruit of the tree is increasing in extent and size, so spray applications to protect the new areas as they develop must be frequent.

Satisfactory disease control cannot be secured by faulty applications or inadequate spray coverage. For the spray to function efficiently all parts of the tree must be covered thoroughly with the preparation. Most if not all of the failures to secure pest and disease control, even when the correct sprays are applied, may be attributed to inadequate spray coverage because of faulty application. One hundred per cent. coverage of the trees is only just enough.

Spraying Points

The following points should be kept in mind when spraying is to be done:—

1. Spray thoroughly and at the correct time.
2. Endeavour to choose a calm day for spraying.
3. In damp weather do not spray late in the day, when sprays will not have time to dry. Slow drying increases injury to the fruit and foliage.
4. Respray after heavy rain, especially if the spray has not had time to dry.
5. Do not try to spray from one angle. Several angles are necessary for complete coverage.
6. If the spray nozzle is set at an angle on the rod, it is easier to obtain coverage on the undersurface of the leaf.
7. **Do not** spray fruit with insecticides such as D.D.T. or arsenate of lead within 3 weeks of harvesting.
8. Keep all spray materials out of reach of small children and do not be careless about leaving unused spray around. Pour it into a hole in the ground.

[*Shell Photographic Unit*

Raspberry aphides on a raspberry shoot. If these pests appear, the plant should be sprayed with nicotine sulphate at 1 : 800 (4/5 fl. oz. plus 2oz. of soft soap in 4 gallons of water). The treatment should be repeated 10 days later.

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Water !

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9. Clean out the pump, hose, and spray container after use by pumping clean water through them.

Treatment of Different Fruits

Spray programmes for the under-mentioned fruits were not given in the table in the article "The Home Orchard in Spring".

Tree Tomatoes

Spray tree tomatoes with lime sulphur ¼ pint to 4 gallons of water to combat powdery mildew, prevalent on leaves at this time of the year. The spray should be repeated when the mildew reappears.

Passion Fruit

Brown spot, a fungous disease, is generally apparent on passion fruit in February and March. The disease affects leaves, fruits, and laterals, causing defoliation, shrivelling, dropping of fruits, and ultimately death of the vine. Pruning in spring followed by thorough application of Bordeaux mixture 3 : 4 : 50 (4oz. of bluestone, 5½oz. of hydrated lime, and 4 gallons of water) or copper compounds such as "Cuprox", "Cuprokylt", and "Oxicop" at 3oz. in 4 gallons of water at monthly intervals throughout the year safeguards the vines and checks the spread of the disease.

Chinese Gooseberries

The leaf-roller caterpillar is one of the few insect pests which attack the Chinese gooseberry, and if neglected, it is capable of causing considerable damage to the fruit. The caterpillars can be controlled by spraying the vines with arsenate of lead (1oz. to 4 gallons of water) or D.D.T. (at the strength recommended for the formulation used). Spraying should be started near the end of December and continued at 3-weekly intervals until February if necessary.

[*Shell Photographic Unit*

Codling moth larva in section of an apple. For control of this pest trees should be sprayed after petal fall with D.D.T. 50 per cent. wettable powder at ½oz. to 4 gallons of water; 18 to 21 days after the D.D.T. application a spray of 1oz. of arsenate of lead plus 2oz. of hydrated lime to 4 gallons of water should be applied and repeated every 18 to 21 days.

Summer Pruning of Grape Vines

A system of summer pruning whereby the tips of the growing shoots are removed is known as tipping or deshooting. The purpose of this treatment is to divert nourishment otherwise expended on surplus growth into the development of the fruit. If done with discretion, tipping is useful, but it must be stressed that too drastic removal of foliage weakens the vine and impairs its ability to mature the fruit properly.

Tipping should be done about December and may have to be repeated later if shoot growth is very vigorous.

Any lateral growth causing congestion of the foliage should be removed. Thinning the foliage in this manner will reduce the incidence of fungous disease by increasing air circulation and facilitating spray penetration.

Cultivation

Cultivation around fruit trees should be sufficient to keep weed growth to a minimum and the surface soil open and friable without leaving it in coarse hard lumps or too finely powdered.

[*Department of Scientific and Industrial Research*

Hard wax scale. Left—Young forms on a citrus leaf. Right—Adult scales on a citrus twig. For control spray in May with summer oil at ½ pint to 4 gallons of water.

Thinning of Pip and Stone Fruits

For pip and stone fruits thinning out of clusters of fruit is desirable to achieve larger and better fruit and to assist in disease control. All thinning should be completed by mid-January. For apples and pears not more than three fruits per cluster should be allowed—twos or singles are preferable. Stone fruit, which should have been thinned before the end of November, should be well spaced as singles over the bearing wood. Late thinning of stone fruit is not very effective—thinning should be early and thorough.

Harvesting

Mature fruit should be picked every day or two. Most fruits may be tree ripened, but pears should be picked in firm condition and ripened at room temperature. Lemons keep better if picked while still light green or silver in colour. Fruit should be handled with extreme care at all times to avoid injury, especially if it is to be stored.

After-care of Grafts

Sealing compounds on grafts should be checked and renewed if necessary. Any ties previously overlooked should be cut away. Any shoots arising from the stock should be removed. Where necessary support should be provided to avoid wind damage to young grafts.

Soil Types and Potash Responses in Auckland Province

By J. E. BELL, Fields Superintendent, Department of Agriculture, Auckland

POTASH is assuming increasing importance as a factor in improvement in production. On well-farmed areas the use of phosphatic fertilisers seems now fairly adequate and no great increase in production can be achieved by stepping up the use of phosphates on such farms. Potassic fertilisers, however, have been neglected and if used where needed, are a great potential source of increased production on some important soil types.

SOME of the soils of Auckland Province in their virgin state are so deficient in potash that full progress cannot be made without it. This applies to most of the peat soils (for example, Rukuhia peat), to the ironstone soils of North Auckland (for example, Okaihau friable clay), and some gumland soils (Wharekohe silt loam). This deficiency continues when the soils are farmed and may be intensified if applications of potash are not made.

Other soils are reasonably well supplied with potash. These include notably the limestone clays (for example, Arapohue clay), consolidated sands (for example, Red Hill sandy loam), and estuarine muds (for example, Hauraki clay). Some soils even under great exploitation, such as the continued growing of cash crops, have not yet revealed potash deficiencies.

In between these extremes of low and high initial potash content lie the bulk of soils of Auckland Province.

Deficiency Induced by Farming

Many of the last group of soils have been broken into pasture and farmed very successfully without the use of potash for some years, though sooner or later deficiencies begin to reveal themselves. Often the symptoms are accepted as natural occurrences. Farmers say: "This pumice country when first broken in used to grow red clover up to the height of the fences with the use of superphosphate, but however much superphosphate I apply today I cannot get the same growth". Red clover has a high demand for plant nutrients of all kinds and a deficiency of one, such as potash, will result in a marked decline in vigour of this plant.

This growing deficiency of potash appears to be very prevalent, for potash deficiency now occurs on many of the soils of Auckland Province which have been farmed for some time, though in places potash deficiency reveals itself only a short time after farming begins. Soils liable to become potash deficient under farming include most soils derived from volcanic ash, as, for instance, soils derived from the Waihi shower (for example, Waitekauri sandy loam), from the Mairoa shower (for example, Ohaupo silt loam), and from the Taupo shower (for example, Taupo sandy silt). This applies also to alluvial soils derived from volcanic material (for example, Horotiu sandy loam). It may develop, however, on almost all soils after intensive use of phosphate and lime and with particular kinds of management.

Deficiency Induced by Management

Most of the potash in pasture, fodder crops, or lucerne is returned to the pasture through the urine of stock. If this is concentrated on a few fields at the expense of the rest of the farm, the few fields become well supplied with potash while the rest of the farm may suffer from potash deficiency. The management that brings about this state is the constant cutting of one or two fields for hay or silage and the use of separate fields for day and night grazing of milking cows. Hay and silage fields are very liable to be deficient in potash, and fields grazed only in daytime are also likely to require potash. They could also become deficient in other elements, but usually the needs of lime and phosphate are supplied by the general practice of applying phosphate and lime where needed to pastures, with heavier rates on fields in poor heart.

More even grazing and the cutting of fields in rotation for hay or silage help to even out the potash supplied by stock. The deficiencies caused by unequal stocking in the past are, however, more quickly made good by the use of potash fertiliser.

Applications of Potash

Once the available potash has fallen to a very low level some soils, such as those derived from water-sorted volcanic ash, may require very heavy applications of potash to remedy deficiencies and may need liberal dressings to maintain an adequate supply of potash in the soil. In one trial on Horotiu sandy loam red clover did not grow vigorously until 4cwt. per acre of muriate of potash was supplied. Two hundredweight was not enough to produce this result; 3cwt., which was not tried, may have been sufficient. Two hundredweight, though it brought along a vigorous growth of white clover, did not affect the red clover sufficiently to make it dominate the sward. Similar effects have been noted on other soils derived from water-sorted volcanic ash and in a trial on soil derived from peat and volcanic ash. Trials indicate that on some soils fairly liberal annual dressings of potash are needed to maintain the increase in production brought about by the heavy applications, at least for a few years.

Other soils, usually heavier in texture than those mentioned above, such as the semi-volcanic land of Franklin County (Patumahoe clay loam) and clays derived from certain sandstone formations (Manurewa silt loam), do not seem to need very heavy initial applications to correct deficiencies; 1cwt. of muriate of potash per acre is usually enough, and subsequent applications of ¼ or ½cwt. may be the most that is needed.

On Patumahoe clay loam the effect of one dressing of potash across a field was noted to last for several years, whereas on the lighter-textured soils derived from volcanic ash the effect of potash soon goes. From this it may be deduced that on some soils, including the lighter-textured pumice soils and the light soils occurring mainly in South Auckland derived from andesitic ash, heavy applications of potash will have to be made regularly, whereas on the heavier-textured soils the potash status can be maintained by regular light applications or by less frequent heavier ones.

Time of Application

Trials show that potash is most effective for 4 to 6 months after application, provided the weather is mild and the soil moisture supply is adequate. For that reason applications in spring may be a little more effective than those in autumn. This may be especially so in cold climates. However, increased production in spring is largely conserved as hay and silage and is not nearly as valuable as increased production at other times of the year. Hence applications in autumn would generally be more profitable.

However, on soils where potash is readily lost owing to leaching, such as peat soils, it may be advisable to avoid the severe leaching of potash that might be caused by heavy winter rains. On peat soils therefore applications are probably best made in spring or twice annually—a small application in early spring and another in autumn or November. November applications are also worth trying on soils other than peats as an alternative to autumn applications.

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* * *

Some soils of Auckland Province in their virgin state are so deficient in potash that full progress cannot be made without it. This applies to most peat soils, ironstone soils, and some gumland soils.

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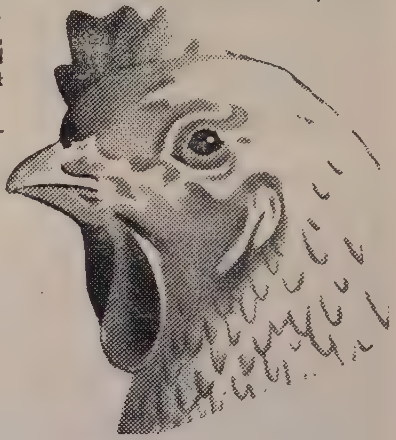

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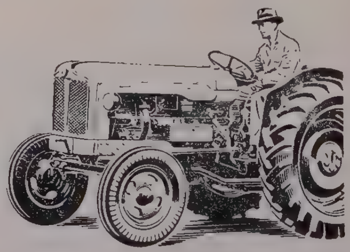

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Herbaceous Borders during Spring and Summer

IT is a mistake to think that hardly any attention is required to the herbaceous border once it is planted. However well planned the border may be in relation to the height, colour, and distance apart of plants, the treatment the border must receive as a very necessary follow-up during the growing season will make or mar the final effect. Work in the herbaceous border during spring and summer is discussed in this article by H. P. Thomas, formerly Horticultural Instructor, Department of Agriculture, Wanganui.

[*Sparrow*

THE work that must be undertaken during summer is much the same for either a newly planted or an established border, and it comprises such operations as weeding, thinning, staking, watering, manuring, disease and pest control, "cutting over", and "cutting down". Replenishment and addition of stocks of many herbaceous plants may also be undertaken during November and December by sowing seeds of several kinds.

Weeding

Weeds will be germinating and growing vigorously from early spring and every opportunity must be taken to eradicate them when they are young. Regular light cultivation during the spring not only combats persistent weeds, but also aerates the soil at a time when there is more opportunity of working among the plants without damaging top growth.

The hoe may be used if care is taken to see that valued plants are not damaged or completely severed. Light forking through the border is often recommended to minimise root damage and this method makes a thorough job in capable hands. Forking also enables the gardener to lift out perennial weeds which would otherwise be hoed off and left to grow again. If perennial weeds are particularly bad in certain areas of the border and lodged among the plant roots, it is advisable to take particular note of where this infestation is so that the plants concerned can be lifted and thoroughly cleaned during the winter. Vacant areas of ground can also receive similar attention. If annual weeds get to the seeding stage through unavoidable circumstances, it is very necessary that they be removed and not left lying on the ground, as such kinds as groundsel, shepherd's purse, ground cress, and chickweed, even though cut off by the hoe, have sufficient sustenance left in them to ripen the seeds already formed.

Watering, Mulching, and Manuring

During dry periods watering may be necessary, but if it is done it should be thorough. A good soaking is worth a dozen sprinklings, and if possible should be carried out in the morning or evening rather than in bright sun. If the supply of water is restricted, it would be better to water those plants that appear to need it most; for example, perennial phlox and delphinium. After watering, a mulch should be given to conserve the moisture as long as possible. A layer of leafmould, compost, old farmyard manure, sawdust, or spent hops can be used as a mulch. These materials are particularly valuable on light, sandy soils. A mulch should be applied after a thorough watering or after rain.

An annual manurial topdressing should be applied to the border as soon as the soil is workable in spring. A dressing of compost, decomposed farmyard manure, or a complete fertiliser may be scattered over and worked lightly into the border to replenish the food used up by the plants in the course of a season. A complete fertiliser which may be applied with advantage to most flower gardens is made up as follows: 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of muriate of potash at 2oz. to the square yard. This annual dressing is particularly beneficial to those plants which resent disturbance and are of a semi-permanent nature, such as peony, gypsophila, and romneya, and to all border plants during the years when renovations have not been carried out.

Thinning

Many herbaceous perennials make very rapid growth and require division and replanting every 2 to 3 years to maintain the plants at the peak of efficiency. In addition to the periodic renovation of the border many vigorous-growing perennials such as delphinium, perennial phlox, perennial aster, heleniums, and rudbeckias often produce more new shoots each year than are required for the best results, and thinning of these is recommended. This excessive growth leads to smaller flowers and crowded conditions suitable for the establishment of pests and diseases and thinning should be carried out in the spring when the shoots are 6 to 8in. high. All the weaker growths should be removed first, and finally the remainder should be thinned to a reasonable number of strong growths, according to the vigour and nature of the plant receiving attention.

Staking

Herbaceous plants should be staked carefully before the plants become too large and it is important to use supports a little shorter than the height of the plants when fully grown so that the display is not marred by unsightly protruding stakes. Good staking is an art and should be based on a knowledge of the growth of the plants being handled so that natural growth is interfered with as little as possible. With this knowledge and with the use of stakes and twine as inconspicuous as possible, suitable methods of staking can then be chosen for most types of growth in the border. A few stakes and ties applied early will save time and trouble later on, and the results will also be far better.

Staking, however, is sometimes better done in several stages to avoid ugly 4 to 5ft. stakes alongside a tall growing plant still only 2ft. high. In such cases it would be advisable to use first a few shorter stakes followed by taller ones when the extra height makes this necessary. Natural results are obtained by staking early the smaller herbaceous plants with brushwood (dead manuka or macrocarpa growth devoid of leaves) placed around and among the groups in such a way that the plants grow up through these branches and gradually hide them. If necessary, a few taller stakes can be added from time to time. A different type of staking is necessary for such plants as hollyhocks, delphinium, and others producing extra-long inflorescences, and the stems of these should where possible be staked and tied individually. For best results with these plants the stakes should be long enough to reach almost to the

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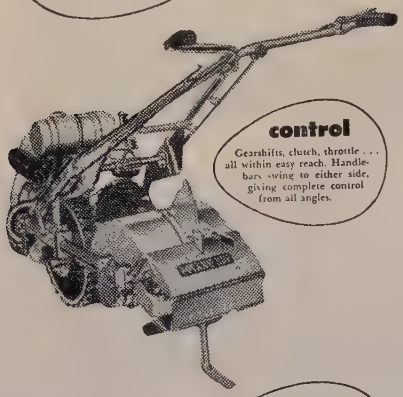

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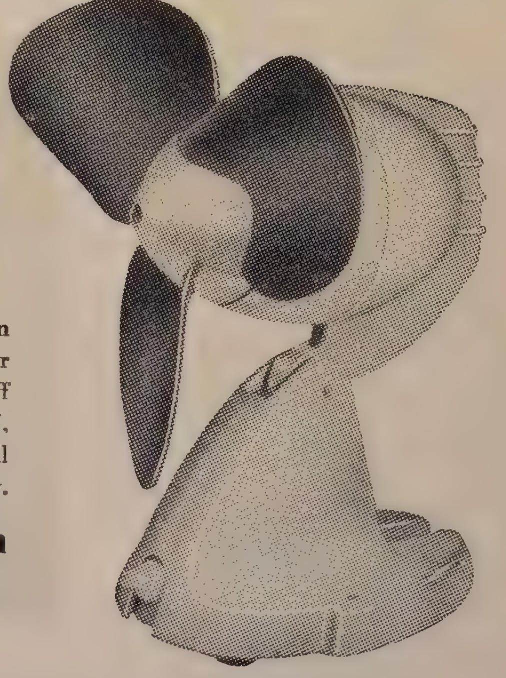

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point on the flower stalk where the flower begins and the supports should be kept as erect as possible.

Such subjects as perennial aster (Michaelmas daisy), helenium, rudbeckia, and solidago, which are of medium height, should be so staked that the main stems are encouraged to radiate from the centre crown instead of being bunched.

When a tie is being run around the stems some of the laterals or side growths should be encouraged to grow outwards and help to hide the artificial support used. Where only a few stakes are used they can often be placed at the back of the plants so that they will eventually be hidden at least from the front of the border. The gardener must practise camouflage when possible. For the smaller subjects such as aquilegias, pyrethrum, and lychnis, neat bamboo or wire supports are to be preferred.

Another support used successfully overseas and one which would appear to be worth trying in New Zealand where large borders of herbaceous plants only are grown is sheep netting. This is spread either along the entire length or could be in several lengths along the back of the border where the medium to tall plants are mainly to be found. It is supported by strong stakes 2½ to 3ft. high, and all of it should be in position just before the plants reach this height, and in a short time they will grow through the netting and eventually hide most of it.

Raising Plants by Seed

The raising by seed of new and additional plants for the herbaceous border is an important job for November and December. Raising plants from seed has its limitations and is mainly confined to species and those hybrids which come more or less true from seed. Carefully selected strains from reputable firms can be relied on to produce a fair percentage of plants true to colour. The same applies to all plants, but it is particularly important to raise perennials from good strains of seed. A number of perennial plants can be raised readily from seed and are difficult to propagate in any other way. The following can be raised in this manner with confidence: Linum, aquilegia, meconopsis, potentillas, statice, oenothera, hollyhock, and agrostemma.

Others easily raised from seed are *Lupinus polyphyllus*, coreopsis, *Chrysanthemum leucanthemum*, delphinium, anchusa, gaillardia, pentstemon, dianthus, armeria, and geums.

Seed should be sown fresh to ensure a high percentage of and quick germination, which also make for sturdier plants by the following spring and summer.

The seeds of most perennials and biennials can be sown in the open ground if great care is taken, but by the use of boxes interference by pests, weather, and weeds is largely overcome. If it is intended to sow seeds in the open ground or in frames, the soil should be moderately rich, as weed free as possible, and broken up to a fine tilth before the drills are prepared. If the weather is dry, the ground should be watered several hours before the seed is sown. Constant attention to weeding and further waterings may be necessary through the summer until the plants become large enough to transplant into the border or nursery bed.

When the plants are raised indoors the seed should be sown in pots or boxes of sterilised soil comprising 2 parts (by bulk) of turfy loam, 1 part of leaf-mould, and 1 part of clean sand. To each bushel of this mixture add 1½oz. of superphosphate and ¾oz. of ground limestone before turning it three times to obtain the correct mixture. Artificial heat is not necessary and after the seed is sown the containers may be placed in a glasshouse, frame, or on a veranda.

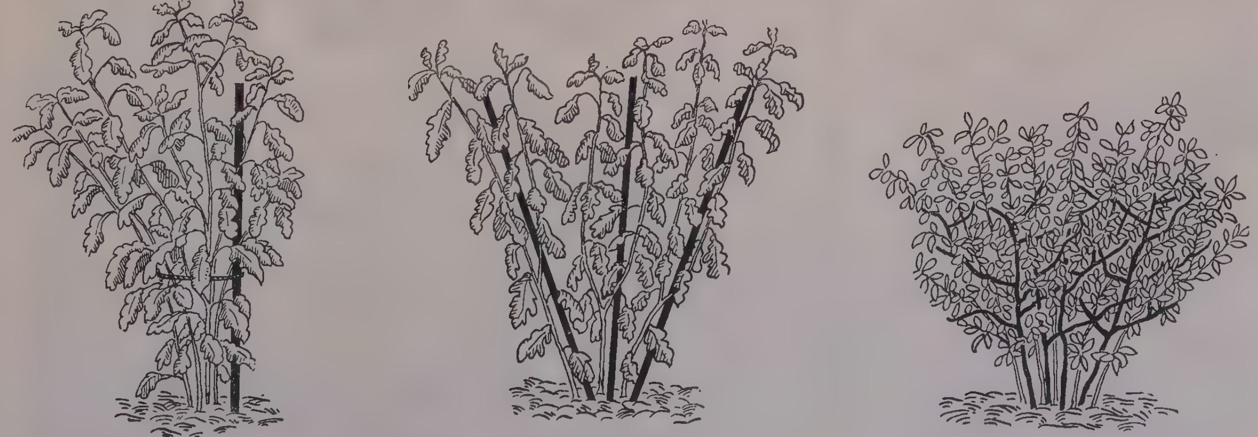
If a good watering is given to the prepared boxes several hours before sowing, further watering should be unnecessary until after germination has taken place. It is advisable to cover the boxes when sowing has been completed with a sheet of glass and paper to avoid rapid drying out of the soil and to provide shade. As soon as the seedlings appear the coverings should be removed to admit air and light, but if necessary shading should be given from direct sun. As some of these seeds, for example, aquilegia, perennial phlox, primula, and meconopsis, are often slow to germinate, the boxes would be best left undisturbed for as long as 6 weeks before hopes of seeing young seedlings appear are abandoned.

The young seedlings are then pricked off into boxes as soon as they can be handled to avoid their developing into weak, leggy plants because of overcrowded conditions. A flat pointed stick such as a wooden label is ideal for gently prising them from the soil with as much earth as possible adhering to their roots. The holes should be sufficiently deep to accommodate the roots of each plant and the soil should be pressed gently but firmly around the base of each seedling, allowing 3 to 4in. each way between plants, depending on their habit of growth. Later a gradual hardening off treatment is given, from frames to the open, the frames being covered for a start and later only when adverse weather prevails. The young plants are eventually lined out in an area of ground to be used as a nursery bed, from which the sturdiest plants can be transplanted to a place in the border during the following autumn or spring.

Removal of Spent Flowers and Growth

Plants throughout the border showing seed heads and withered tops look untidy and often indicate lack of care on the part of the gardener. Flowers should be removed as soon as they are past their best to extend the flowering season and to ensure that the later flowering sorts may bloom in tidy surroundings. It would simplify this work to have a bucket, barrow, or similar receptacle for weeds, spent flowers, and other refuse.

As the sap from the top growth returns to strengthen the crown from which the following season's growth is produced, it is wise first to remove only the finished flower heads and gradually cut back the dying stems later. These stems should be cut cleanly and not be dragged at; otherwise the crowns will be injured and future growth retarded. If plants



Such subjects as perennial asters, chrysanthemums, and heleniums should be staked so that the main stems are encouraged to radiate from the crown (centre) instead of being bunched (left). For the smaller herbaceous plants strong branches devoid of leaves may be used (right). With growth many branches are hidden and the plants appear to stand up naturally.

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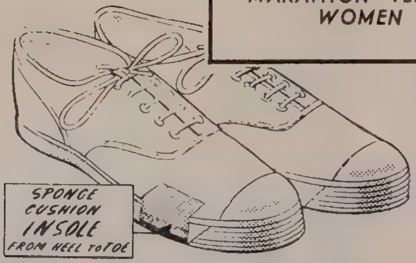

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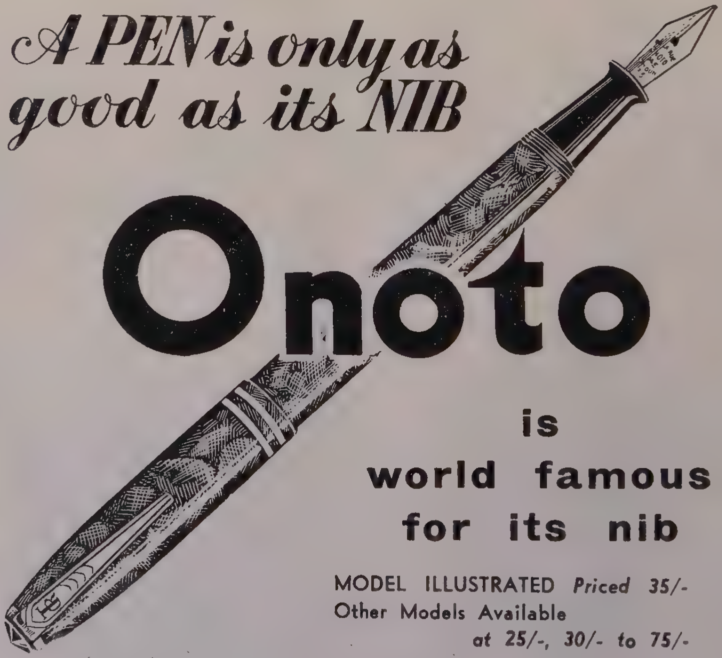

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which cease flowering early such as lupins, pyrethrums, trollius, doronicums, and delphiniums are cut back immediately the flowers are over, they are often induced to make further growth for a second flowering in the autumn. This second flowering is considered to be less exhausting to the plant than the development and ripening of seed heads, which should only be allowed to form for the express purpose of seed saving.

Even if the flowers do not appear again, the growth from the base of the plants at least looks fresh and green for the rest of the summer.

Supplementary Plants

With the use of herbaceous perennial plants only it is difficult to have a continuous display of flowers from November to April and it is usual therefore in New Zealand to make provision in the borders for plantings of choice annual and biennial plants as well as bulbs and some shrubs. Many gardeners prefer to grow their own bedding plants and this is undoubtedly more economical where large numbers of plants are required. Half-hardy annuals are usually sown from July under glass, and after being pricked out into boxes and gradually hardening off, they are planted out in the open when all likelihood of frost is past.

Hardy Annuals

Many hardy annuals may also be sown and raised out of doors instead of in boxes from September onwards in most districts. The weather and soil conditions will be a good guide in this respect, and where the soil cannot be brought to a workable condition seed sowing in the open should be postponed until conditions are more suitable. Seeds of the hardy annuals require less exacting conditions than those sown under glass and any good garden soil that is favourably situated, well drained, and well supplied with organic matter should give satisfactory results. The soil should be reasonably weed free; otherwise patient weeding will have to be done or the seedlings may be retarded.

A succession of blossoming periods should be the aim, and sowings should be made at different times. Transplanting may be done into boxes or direct into the border as the plants become large enough.

The following plants could be included in this group: Larkspur, cornflower, candytuft, calendula, annual chrysanthemum, nigellas, sweet peas, sweet alyssum, sweet scabious, dimorphotheca, and helichrysum.

Certain annuals, however, dislike transplanting and these prefer to be sown directly into the positions where they are to flower as soon as soil conditions permit, usually in October and November. The seeds may be sown broadcast in irregular patches, rows, or in circles, but sowing should always be thinly done to conserve seed and to avoid excessive thinning and weak plants. Some of the plants in this group are mignonette, virginian and

[*Douglas Elliott*

Double gerbera *Gerbera jamesoni* is a splendid herbaceous plant for a mixed flower border in milder districts. The plant is excellent for cut flowers in brilliant colours.

Seed beds against the northern wall of a building are splendid for raising seedlings. [*Sparrow* evening scented stock, nasturtium, linum, shirley poppy, nemophila, linaria, clarkia, godetia, and eschscholtzia.

As soon as these sowings are large enough to handle and appear reasonably well established they should first of all be thinned out to 4 to 8in. apart each way and again later to a final spacing 12 to 18in. apart, according to the ultimate height and habit of the plant.

Planting out

When annuals are used to supplement the display planting out may begin from October in most districts. A better effect is obtained by planting a large group of one particular flower than by having several smaller patches. All available space should be made the most of by removing annual flower groups as soon as they become ineffective, and by replacing with further plants or sowings of seeds. Every effort should be made to provide a succession.

Ground set aside for these plantings should be well forked over and manured with farmyard manure if available. In addition a mixture of 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of muriate or sulphate of potash should be applied and raked into the topsoil at 2oz. to the square yard. If the ground is dry, a watering should be given the day before planting begins. No plants should be set out if they show any trace of dryness at the roots. If the containers have become really dry, they should be given a thorough watering or stood in a shallow bath for some hours until soaked through and then allowed to drain a few hours before planting. This treatment will ensure that there will be no check through dryness or from the loss of excessive soil from around the roots of the young transplants. The choice of an overcast day or the carrying out of this work during the late afternoon is advised, however. If a prior watering is given to the plants and the ground, there should be no excessive wilting. If the plants have had to be kept too long in the boxes, premature flower buds may be showing and these should be removed to promote well-branched plants for a maximum display.

It is advisable to keep a few plants in reserve for replacements.

Garden Work for December

As the longest day approaches and warmer and more settled weather may be expected, the opportunity should be taken to give the flower garden a general clean-up before the middle of the month. Weeds do not take a holiday, therefore if a vacation or a rest is contemplated during the festive season, weeding, staking, thinning, and a general "go through" is very necessary beforehand. Choose a dry, windy day if possible and hoe or hand weed through the garden to ensure that the weeds do not get to the seeding stage over the holidays. Annuals from late sowings will need thinning and this should not be skimped, as crowded plants cannot give the best results. Some plants such as shirley poppies, cornflower, godetia, and clarkia may need light support, and this can be given by inserting short bushy branches between them and most of this should eventually be hidden from sight. The planting out of tender plants such as salvia, zinnia, balsam, heliotrope, celosias, and tuberous and fibrous rooted begonias should now be concluded even in the coldest districts.

Dahlias

Dahlia plants will now be growing strongly and where young plants have not been used it may be found that excessive growth is coming away from the old tubers.

Thinning of some of these shoots would be wise and these should be carefully pulled away from the tubers with the fingers, as cutting them may only encourage further growth from lower buds that remain. Early staking is necessary, and if possible the supporting stakes should be a little shorter than the ultimate height of the plants. The ties should be reasonably loose around the plants but fixed firmly to the stakes to avoid them slipping down. Watering will be necessary if dry periods are experienced, and a thorough soaking should be given instead of merely wetting the surface of the ground. Later the surface of the soil should be gone over lightly with a fork or hoe to break it up and prevent it from caking.

Chrysanthemums

Although many chrysanthemum plants look quite capable of supporting themselves, it is wise to stake them and as with most herbaceous plants it is necessary to do this as early as possible to avoid damage. The plants should be securely but not tightly attached to the stakes from the outset. Potted chrysanthemums should be in their final 10 to 12in. pots this month. Supports should be given and the soil made firm. Stopping or pinching back of top growth to encourage branching may be necessary at this stage of their growth if no natural breaks have occurred.

Perennials and Biennials from Seed

Seeds of both perennial and biennial flower plants may still be sown if this work was not carried out as described in these notes last month. Selected strains from reputable firms should be chosen and a selection may be made from the following kinds:—

Perennial: Aquilegia, meconopsis, statice, hollyhock, lupin, coreopsis, delphinium, anchusa, gaillardia, thalictrum, pentstemon, dianthus, armeria, oriental poppy, heucheras, and geums.

Biennial (or those treated as such): Wallflower, sweet william, Canterbury bells, myosotis, *Bellis perennis* (double daisies), Brompton stock, and lunaria (honesty). Iceland poppies can also be sown at the present time. They may be sown either in boxes or in a seed bed in the open, but where the former is chosen interference by pests, weather, and weeds is to a large extent overcome.

Seeds sown last month may now have germinated and as soon as the seedlings are large enough to handle they should be pricked out into boxes 2in. apart each way.

Spring Bulbs

The foliage of most spring flowering bulbs will now be changing colour, except for a few of the late varieties of narcissi, and they will therefore be looking rather untidy. Spent foliage may gradually be removed and the healthier tops tied in bunches to make the bed respectable until all top growth can be dispensed with.

If it is desired to use the ground immediately, the bulbs should be lifted and replanted in a spare part of the garden to finish off the ripening process.

The bulb's future well-being depends on the food supply obtained from its leaves; therefore it is wise to wait until the foliage has turned brown and withered before lifting the bulbs for storing.

When the bulbs are ready for lifting they should be thoroughly dried and placed in single layers on shelves or in wooden trays in a dry, airy, cool place.

Lawns

To maintain a healthy growth lawns should now be given their quarterly fertiliser dressing of 3 parts of sulphate of ammonia to 1 part of superphosphate at 1oz. to the square yard. To ensure even distribution it is usually best to mix the fertiliser with an equal quantity of dry soil or sand, dividing the mixture into two equal lots. Each lot should then be spread at right angles to the other and each should cover the whole area of the lawn.

German or Bearded Iris

Clumps which have been undisturbed for three or four seasons may be lifted early in December and strong young shoots replanted immediately.

Choose strong young growth from the ends of the old woody rhizomes with up to three shoots according to the vigour of the variety. To assist the roots in re-establishment cut back the leaves to within 5 or 6in. of their bases before planting.

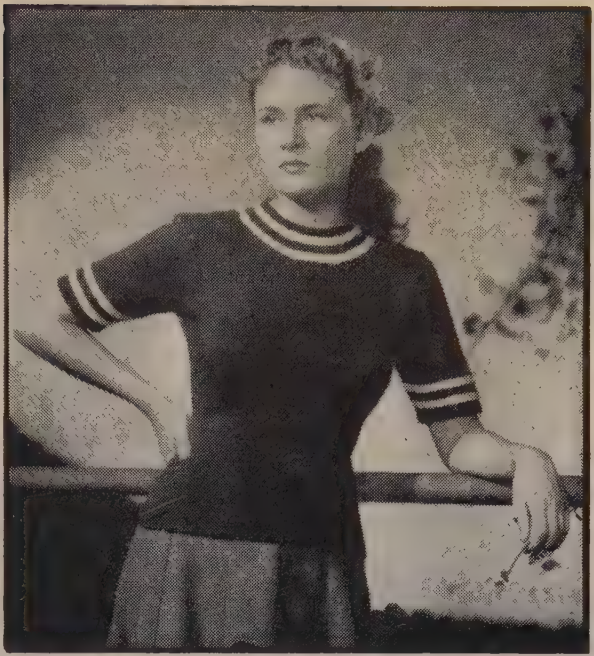
Work under Glass

Sowings of cineraria and the primula varieties mentioned last month may still be made, and in addition seed of calceolaria and cyclamen can also be sown. Plants from earlier sowings of any of the above-named may need potting up towards the end of the month, or as soon as they are a reasonable size. Calceolaria and cineraria plants must not be neglected at any stage, and they thrive best in a cool even temperature. For good results do not over-pot or over-water any of the primulas.

Tuberous begonias growing in pots will also need constant care now to give of their best. Faded flowers and the small side flowers (female) should be regularly removed, and the plants given dilute liquid manure once a fortnight to keep them growing strongly.

Cyclamen corms which have been resting should be showing signs of activity and these may be potted up this month. After becoming established they should be removed to their summer quarters in the cold frame.

Simple and Attractive Summer Jersey



ON occasions in summer possession of a jersey that is not too heavy is very useful, and such a jersey, of the very simple but attractive design illustrated, can be made by following the instructions given in this article. Materials required are: 7oz. of blue 3-ply wool; 1oz. of white 3-ply wool; 2 No. 10 and 2 No. 12 knitting needles; 4 buttons.

MEASUREMENTS are: Length, 22in.; bust, 34in.; sleeve, 5½in.

Tension: 7½ st. to 1in.

Abbreviations: K., knit; p., purl; st., stitch(es); tog., together; rep., repeat; patt., pattern; cont., continue; beg., beginning; st.st., stocking stitch (1 row k., 1 row p.); g.st., garter stitch (every row k.); inc., increase; dec., decrease; m., make.

The Front

Using No. 10 needles and blue wool, cast on 106 st. and work in st.st. for 4½in. Change to No. 12 needles and work 3in. in st.st. Change to No. 10 needles and cont. in st.st., inc. 1 st. at both ends of every sixth row until there are 126 st. Cont. in st.st. until work measures 15in.

Shaping the Armholes

Cast off 4 st. at beg. of next 2 rows, then dec. 1 st. at both ends of every row until 100 st. remain. Cont. on these st. until work measures 19in.

Shaping the Neck

Next row: K. 41, cast off 18, k. 41. Work on this second set of 41 st. only, dec. 1 st. at neck edge on every row until 26 st. remain, then dec. 1 st. at this same edge on alternate rows until 21 st. remain. Cont. on these st. until work measures 22½in., ending at armhole edge.

Shaping the Shoulder

Next row: Cast off 7, work to end. Next row: Work to end. Rep. these 2 rows once. Cast off. Rejoin wool to remaining stitches and work to match first side.

The Back

Work as given for front until armhole shaping is completed (100 st.). Cont. on these st. until work measures 17½in., ending with a p. row.

Divide for Back Opening

Next row: K. 47, turn and work on these st. only until work measures 19in., ending at opening edge.

Shaping the Neck

Cast off 6 st. at beg. of next row, then dec. 1 st. at this same edge on every row until 26 st. remain, then dec. 1 st. at this same edge on alternate rows until 21 st. remain. Cont. on these st. until work measures 22½in., ending at armhole edge. Shape shoulder as given for front. Slip 6 st. at needle point on to safety pin. Rejoin wool to remaining 47 st. and work to match first side.

The Yoke

Join shoulder seams. With right side of work facing, beginning at back and using white wool and No. 10 needles, pick up and k. 6 st. along cast-off 6 st. at back neck shaping, pick up and k. 36 st. up one side of back neck, pick up and k. 1 st. at shoulder seam, pick up 36 st. down one front, pick up 18 st. across front neck, 36 st. up other side of front neck, 1 st. at shoulder seam, 36 st. down second side of back neck, 6 st. along cast off 6 st. of back neck (176 st.).

Work 3 rows in g.st.

Next row: K. 40, k. 2 tog., k. 1, k. 2 tog., k. 86, k. 2 tog., k. 1, k. 2 tog., k. 40 (172 st.).

Next row: * K. 5, k. 2 tog. Rep. from * to last 4 st., k. 4 (148 st.).

Change to blue wool and work 4 rows in st.st.

Next row: K. 34, k. 2 tog., k. 1, k. 2 tog., k. 70, k. 2 tog., k. 1, k. 2 tog., k. 34 (144 st.).

Next row: P. to end. Change to white wool.

Next row: * K. 2, k. 2 tog., k. 2. Rep. from * to end (120 st.).

Work 3 rows in g.st.

Next row: K. 27, k. 2 tog., k. 1, k. 2 tog., k. 56, k. 2 tog., k. 1, k. 2 tog., k. 27 (116 st.).

Next row: K. 1, k. 2 tog., * k. 2, k. 2 tog., k. 1. Rep. from * to last 3 st., k. 2 tog., k. 1 (92 st.).

Change to blue wool and No. 12 needles and work 4 rows in st.st.

Next row: K. 20, k. 2 tog., k. 1, k. 2 tog., k. 42, k. 2 tog., k. 1, k. 2 tog. (88 st.).

Work 7 rows in st.st. Cast off.

The Sleeves

Using No. 10 needles and blue wool, cast on 74 st. and work in st.st. for 12 rows. Change to white wool and work 6 rows in g.st. Now work thus, inc. 1 st. at both ends of next and every following 4th rows. Work 6 rows in st.st., using blue, then 6 rows in g.st., using white. Now cont. in st.st., using blue, still inc. every 4th row until there are 92 st. Cont. on these st. until work measures 5½in.

Shaping the Top

Dec. 1 st. at both ends of alternate rows until 62 st. remain, then dec. 1 st. at both ends of every row until 38 st. remain. Cast off 3 st. at beg. of next 6 rows. Cast off.

To Make up

Press work lightly on wrong side, using a warm iron and a damp cloth. Join side and sleeve seams. Turn up ½in. hems at lower edge of jersey and sleeves. Turn in half the st.st. band on No. 12 needles at neck and slip stitch neatly on wrong side.

The Overwrap

Slip the 6 st. on a safety pin on to a No. 10 needle and work in g.st. for ¾in.

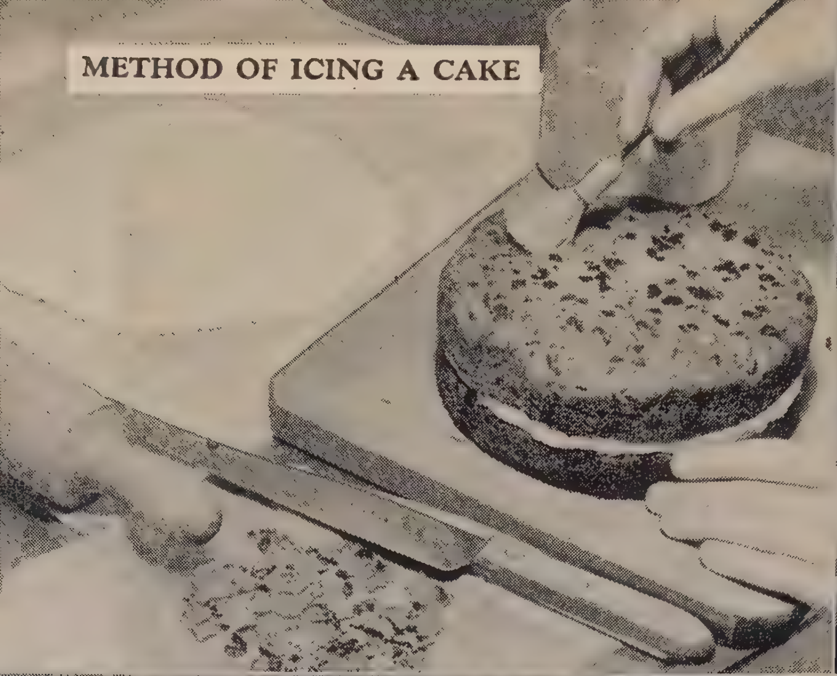
Make a buttonhole in next row thus: K. 2, k. 2 tog., m. 1, k. 2.

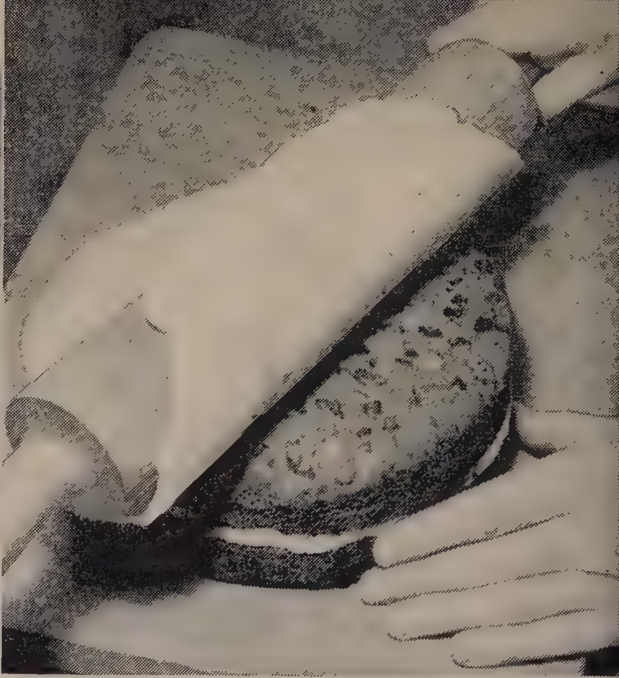
Cont. in g.st., making further buttonholes at 1in. intervals until band is correct length (when slightly stretched) to fit back opening. The last buttonhole should be about ¼in. from the top. Cast off.

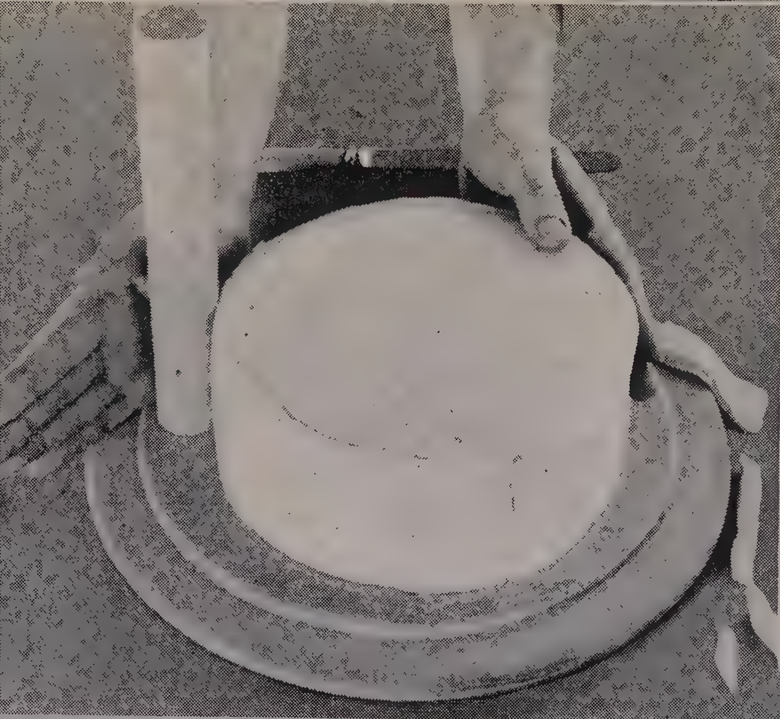
The Underwrap

Using No. 10 needles and blue wool, cast on 6 st. and work in g.st. until band is correct length to fit back opening. Cast off. Sew in underwrap, sew down overwrap neatly on wrong side. Sew on buttons. Press all seams.

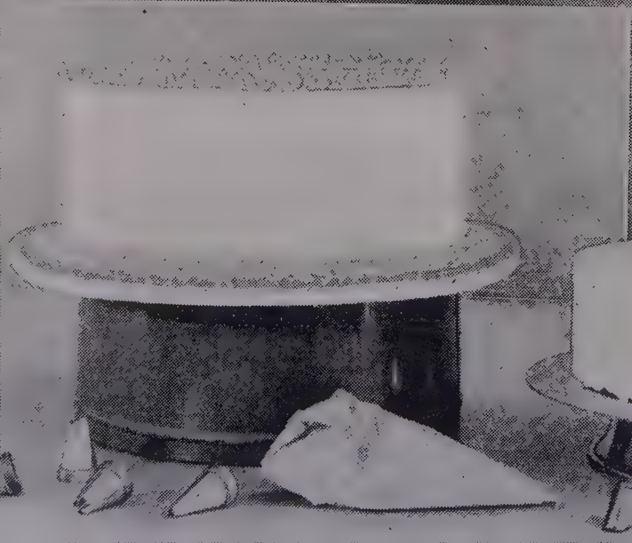
METHOD OF ICING A CAKE

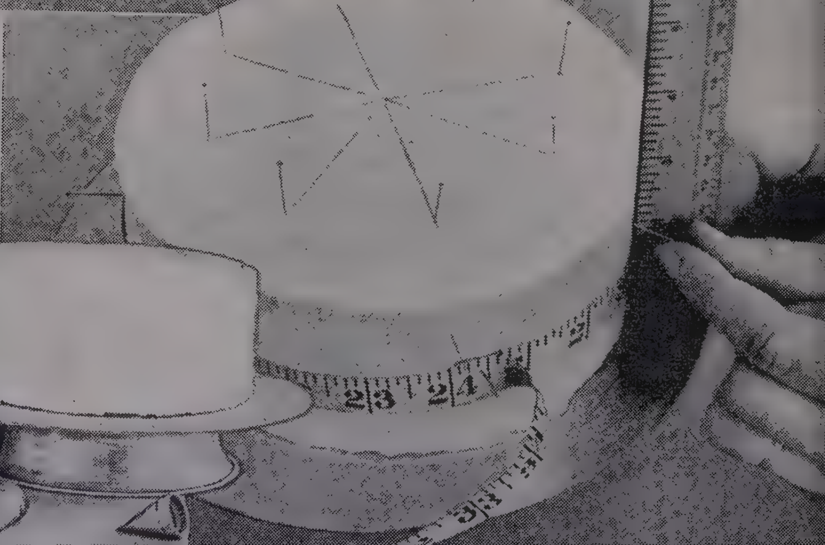






Upper left—The rounded top of the cake is sliced off to obtain a flat surface. Upper right—To avoid breaking the almond icing roll it on to the rolling pin and then roll it off on to the cake. At left—A short length of dowelling rod rolled round the sides of the cake smooths the icing and sticks it firmly to the sides of the cake. Lower left—An icing table or an upturned cake tin supports the cake and allows it to be turned while it is being decorated, thus avoiding the necessity of reaching over. Lower right—A circle of greaseproof paper folded into equal parts will show where to mark a symmetrical design an even depth in from the edges. A tape measure and ruler show where to mark the sides of the cake with pins.





Almond and Royal Icing with Piped Decorations

ALMOND and royal icing and elaborate piped decorations are used for coating and decorating rich cakes for Christmas, weddings, birthdays, or other celebrations. For this type of cake decoration several days are required to allow each layer of icing to set firmly before the next is applied. Molly Macpherson, Field Officer in Rural Sociology, Department of Agriculture, Auckland, here describes the various methods of decorating a cake.

ALMOND icing is usually used as a base to give a flat, crumb-free surface to a cake which is to be covered with royal icing, but it may also be used for moulded or cut-out decorations.

Almond Icing

Before applying almond icing trim the cake to a good shape, using a sharp knife to shave off any rounded top surface so that a flat surface is obtained (see opposite page).

To make the almond icing stick firmly to the cake a thin layer of smooth apricot or plum jam or jelly is put on the cake. A thick syrup of 1 cup of sugar and ½ cup of water boiled together and brushed on is as effective.

Take sufficient almond paste and knead it until it is soft and pliable, lightly dust the rolling pin and board with icing sugar, and roll the paste out to a thickness of ¼ to ½in. Lift the rolled almond icing by rolling it on to the rolling pin and then roll it off on to the cake as shown on the opposite page, completely covering the top and sides of the cake.

An alternative method of putting almond paste on a cake is to take one-third of the paste, roll it out as already described, and place it on top of the cake. Trim the edges with a knife. To cover the sides of the cake roll a strip of paste to go completely round, or use two strips if the cake is large, making very neat joins (see opposite page).

Trim off all surplus almond icing and roll the top of the cake with the rolling pin to make the paste level and to help it stick firmly. With a jam jar or a short length of dowelling rod roll the sides of the cake for the same reasons (see opposite page). Set the cake aside for at least 24 hours to allow the almond icing to dry and harden before any royal icing is put on.

Royal Icing

Royal icing keeps almost indefinitely and coats of royal icing with almond icing help to keep the cake moist. As royal icing holds its shape well and sets firmly, it is the icing to use for piped decorations.

Before the icing is prepared the icing sugar should be powdery and absolutely free from lumps so that a smooth icing will be made. If necessary, roll the icing sugar and sieve it through a very fine sieve. Stir the mixture thoroughly so that air bubbles will not form in it and to obtain a smooth, even texture. Mix it to a thick consistency so that it will hold its shape when drawn up to points with a spoon, but will not be too stiff to be forced through a piping tube. When the mixture is too stiff the pressure needed to force the icing through the tube causes the hand to tremble and the results are uneven.

When the icing is mixed cover the bowl with damp muslin to prevent the surface of the icing drying and becoming lumpy. In this way it may be kept in good condition for several hours while work is being done with it.

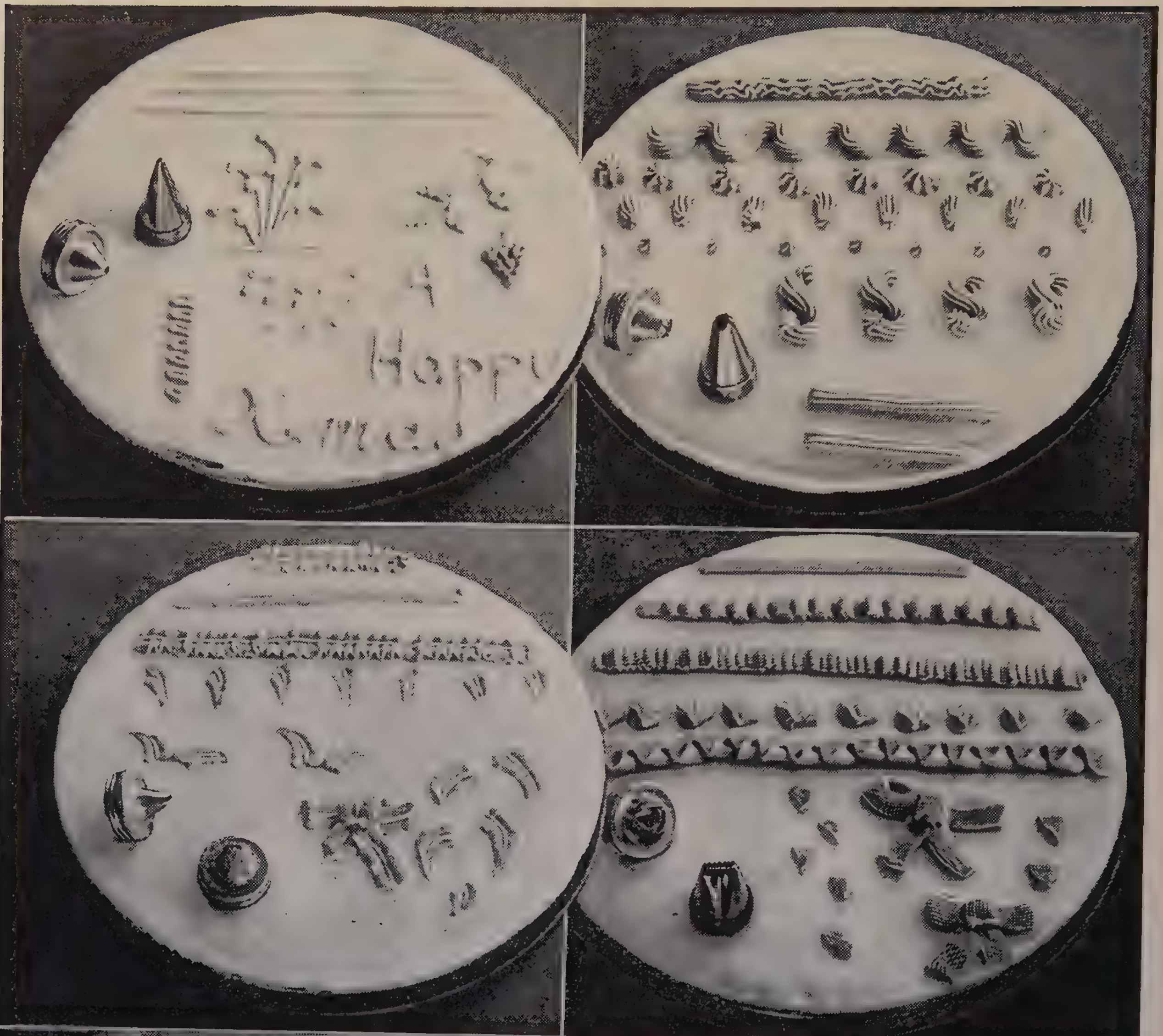
After the almond icing has become firm place the cake (with a little icing to hold it firmly) on a cake board, if required, and then on an icing table or an upturned cake tin (see opposite page). (Icing tables which support the cake and which can be revolved so that the part of the cake being decorated is nearest to the worker are obtainable and not expensive; however, an upturned cake tin can be used as effectively.) A foundation layer of royal icing is applied. The layer should be thick enough to mask the colour of the almond icing and should be smoothed on as evenly and smoothly as possible, although faint knife or spatula marks will be covered easily with the next layer of royal icing.

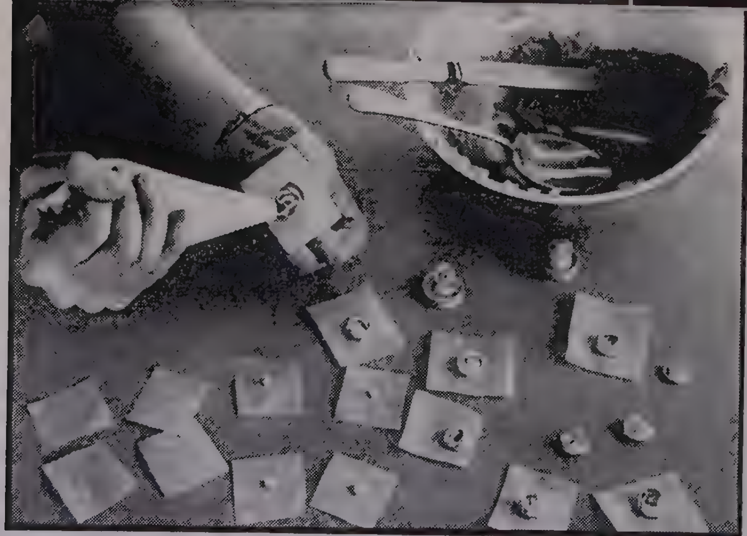
Two or three foundation layers of royal icing should be applied in this manner, 24 hours or more being allowed between the application of each layer for setting and drying. The last layer should be as smooth as possible. A small trowel or a broad spatula gives the smoothest surface. For satisfactory smoothing of the icing the spatula, trowel, or knives may be dipped in hot water and the drops shaken off.

Piped Decoration

For satisfactory piped decorations the design should first be decided on, being planned on paper if necessary. Mark out the main points of the decoration on the iced cake with pins, using a tape measure to mark correct and even spaces. A metal dividing ring or a circle of greaseproof paper folded into equal parts will show where to mark a symmetrical design an even depth in from the edges (see opposite page).

Piped decorations are not difficult, but a little practice may be needed at first before any elaborate work is attempted. The practice may be done on simple designs or on an upturned plate, the various nozzles being used so that the worker can learn what can be done with them. Metal tubes with various nozzle shapes for different piping designs can be readily obtained. These tubes may be used with an icing syringe which will be in the set, or

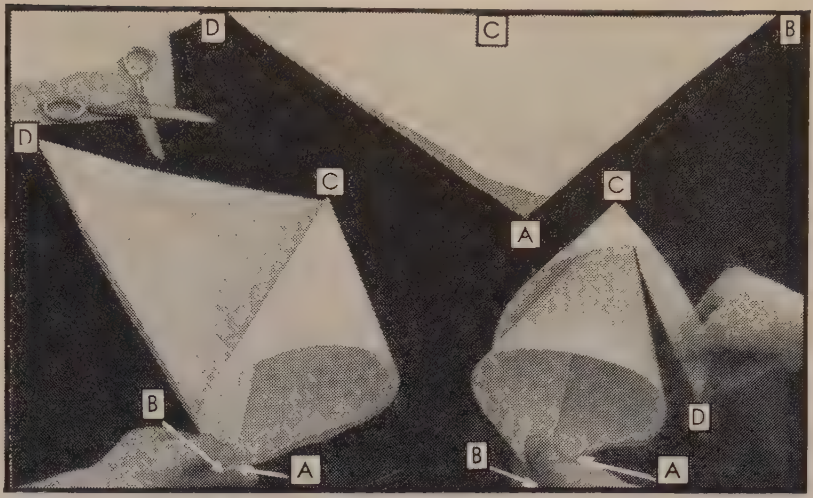




VARIOUS DECORATING TUBES

Upper left—The writing tube is used for making lines, printing, writing, simple flowers, leaves, berries, and trellis designs. Upper right—The rose tube is used for making borders, ropes, rosettes, and scrolls. Middle left—The leaf or ribbon tube is used for making leaves and ribbons. Middle right—The ribbon or shell tube is used for ribbons, borders, shell borders, shells, and bows. Lower left—The petal tube can be used for making flowers on an icing nail or cork.

they may be used with a forcing bag made of calico or drill, but it is often more satisfactory to use a forcing bag made of greaseproof paper, which can be discarded after use. The method of making a forcing bag of greaseproof paper is illustrated at right.



To make a forcing bag of greaseproof paper take a piece of paper 12 to 14in. square and fold it in half diagonally. Take corner B and take it over to A. Take corner D and bring it over to A. Fold the corners A, B, and D together to make the funnel shape. Cut off the point at C and insert an icing tube. Fill the funnel with icing and fold over the top of the funnel firmly so that the icing cannot leak out during use.

Avoid overfilling the forcing bag or icing syringe, and if it has been left aside for a few minutes during use, dip the mouth of the tube in warm water and press out a little icing before recommencing the work, as tiny pieces of partially set icing on the tube may spoil the shape of the design or break the thread of the icing. Moving the tube along too fast while using it will also break the thread of icing. The icing should flow steadily and smoothly. To break off the thread from any icing tube jerk the pipe gently but sharply down and up.

Tubes of Various Shapes

The writing tube has a small round hole in the end. It is used for making lines, printing, writing, simple flowers, leaves, berries, and trellis designs. When using the tube for writing or making long straight lines hold it above the cake. The thread of icing can thus be manoeuvred easily into place and the lines will fall straight without unevenness.

The rose tube: This tube (4-, 6-, or 8-pointed star) can be used to make borders, ropes, rosettes, and scrolls. To make rosettes hold the tube at right angles to the cake.

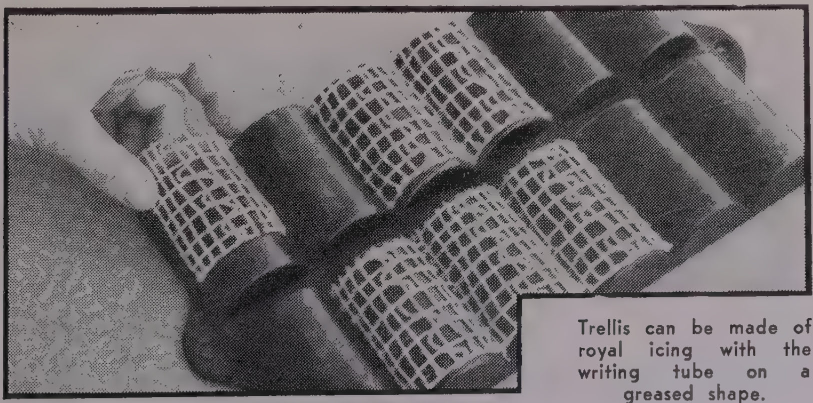
The leaf or ribbon tube is used to make leaves and ribbons. To give a pointed tip to a leaf, finish the movement with a slight pull of the tube, without pressing on the forcing bag. This will draw the icing to a point.

The ribbon or shell tube is used for ribbons, borders, shell borders, shells, and bows. The tube is held at a slight angle to the cake with the serrated side of the tube uppermost so that the decoration falls flat, with the grooved side showing. To make the shells shown in the row fourth from top in the middle right illustration opposite, hold one side of the tube still and swing the other side in a semi-circle.

The petal tube can be used for making icing flowers on an icing nail or the top of a cork. The opening in the tube is wider at one end than at the other end.

Stick a small square of greaseproof paper on the icing nail or cork with a little icing, holding the nail or cork in the left hand and the forcing bag in the right hand. Pipe a small knob of icing for the flower centre and allow it to harden a little. Pipe the petals around the flower centre with the wide side of the tube opening at the base of the flower. Turn the icing nail or cork around slowly with the left hand as each petal is put on. The top edges of the outer petals can be gently turned out. With various tubes other flower shapes may be tried. Flowers are usually made from delicately tinted icing, or a little food colouring may be applied with a fine brush after the flower has set.

Raised trellis designs may be made and when firmly set used to decorate cakes. To make a raised trellis use royal icing and the writing tube and pipe straight lines over a lightly greased round or boat-shaped patty tin or the bottom of a gem iron. Allow the first set of lines to dry a little, then pipe lines across them to give a trellis effect (see below). More sets of lines may be piped to make the trellis stand out well. Allow the iced trellis to dry and set firmly. To remove the trellis from the patty tin lightly warm the tin and gently remove the trellis, which can then be attached to the cake with a little icing.



Trellis can be made of royal icing with the writing tube on a greased shape.

Other Decorations

Such decorations as Christmas trees, storks, silver cachous, and jelly beans can be bought and used when the icing is fresh or stuck on with a little icing when other decorations are firmly set.

Icing Recipes

Recipes for two almond icings and for royal icing are given here.

Almond Icing

1lb. of ground almonds
1lb. of icing sugar
2 eggs
1 teaspoon of vanilla essence
Juice of 1 lemon

Mix the ground almonds and icing sugar. Beat the eggs lightly and add them with the vanilla and lemon juice to the dry ingredients. Mix to a paste and knead thoroughly.

Mock Almond Icing

¼lb. of butter
¼lb. of flour
1lb. of icing sugar
2 egg yolks
1 tablespoon of almond essence

Cream the butter and icing sugar together, add the egg yolks, then the essence, and lastly the sifted flour. Knead the mixture well.

Royal Icing

1lb. of icing sugar
¼ teaspoon of cream of tartar, or
½ tablespoon of lemon juice
2 egg whites

Lightly whisk the egg whites with 2 tablespoons of icing sugar. Gradually add the remainder of the icing sugar and the cream of tartar or lemon juice until the mixture is of the right consistency (stiff enough to stand up in peaks). Additional icing sugar may be required. For foundation coats of royal icing three drops of glycerine added to the mixture will prevent it setting too hard or cracking easily when cut with a knife.

All photographs by Sparrow.

Kitchen Hygiene

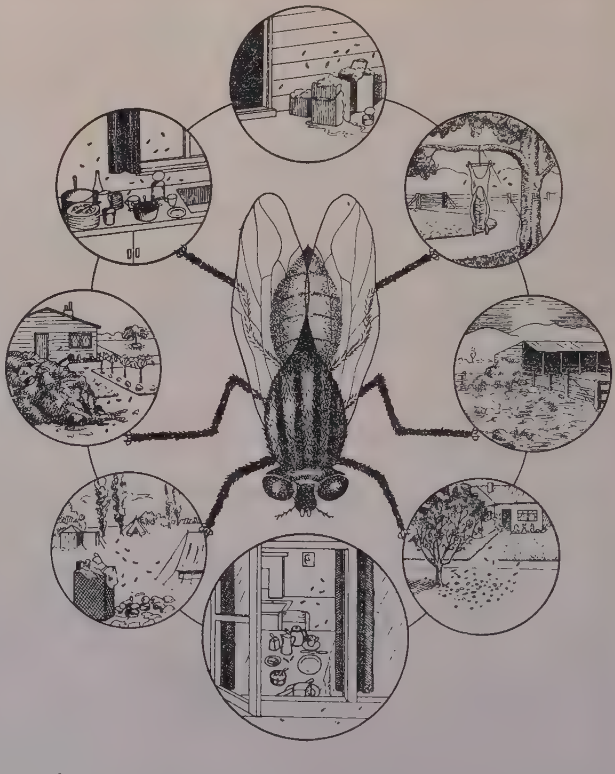
FOOD may be a potential danger unless a strict standard of hygiene is maintained from its source of production to the time it is eaten. It is the responsibility of the housewife to guard against food-borne infections by scrupulous attention to personal cleanliness and to the cleanliness of her kitchen and storehouse and the yard and other areas surrounding her home. To aid in reducing the incidence of preventable food-borne diseases this article by Eleanor Couston, Field Officer in Rural Sociology, Department of Agriculture, Timaru, describes measures for hygienic food handling, the care and storage of cooked and uncooked foods, clean washing up, and the control of flies, rodents, and other disease-carrying pests.

THE illnesses which can be caused through food include those which may be caused by the food itself and those arising from careless handling of food. Certain toadstools and berries and weeds are poisonous; other foods may become poisonous from contact with various metallic substances such as lead. Ill effects may also be caused to some persons through allergic reaction to certain foods. Protection from such illnesses comes from a knowledge of which foods or compounds are dangerous. Other illnesses may arise from the eating of products such as meat or milk which have come from infected animals. The most common illnesses in this group are non-pulmonary tuberculosis and undulant fever. Protection from these is afforded by tuberculin testing of herds and pasteurisation of milk and milk products. In rural areas where home-produced food is consumed the responsibility rests with the producer.

Other serious illnesses may be caused by typhoid bacilli, which are generally transmitted from an infected water supply or from a human carrier; by the organisms which cause sore throats, scarlet fever, and diphtheria; and by hydatids, which can be contracted by eating food which has been contaminated through flies by faecal matter from infected dogs, or which can be conveyed to the mouth by infected hands.

Bacterial infections arise from careless food handling. Bacterial food poisoning which produces the symptoms of abdominal pain and diarrhoea, usually accompanied by vomiting, arises from the eating of infected food or of food in which toxins have developed. Outbreaks of such attacks are most prevalent in the hot months,

Heading photograph by National Publicity Studios.



By elimination of breeding grounds of flies and covering of food the incidence of fly-borne diseases can be reduced.

Children like playing with animals, but to prevent the danger of transferring disease from hands to mouth they should understand the need for washing their hands before they eat anything.

because bacteria develop more rapidly in a warm atmosphere. The duration of these attacks of what is commonly known as summer sickness varies from 2 to 5 days for the infection type and up to 24 hours for the toxin type.

Personal Hygiene

The hands are probably the most common means by which food-borne infections are spread, and the first consideration of the cook should be to keep her hands scrupulously clean. Harmful bacteria may be present on the hands through contact with the nose, mouth, or hair, through the handling of animals, or through the use of the toilet. Nails should be kept short and frequent hand washing is essential. Necessary precautions are washing of the hands with soap and water and scrubbing of the nails with a brush followed by drying on a clean towel. Cuts or abrasions should be covered with waterproof dressings and persons with septic cuts should avoid food handling altogether.

Not only the cook but all children and adults should wash their hands before eating.

Sneezing and coughing are the means of spreading many germs, and careful use of a handkerchief should be habitual. Apart from cleanliness of the hands, general cleanliness of hair, skin, and clothing reduces the possibility of food contamination.

Kitchen Standards

A well-planned kitchen with facilities for proper food storage, washable surfaces, and adequate ventilation and lighting is a major asset in the control of food-borne infections.

Storerooms, safes, and cupboards where food is kept should be dust, vermin, and fly proof and have good circulation of air. All surfaces including ceiling, walls, floor, and benches should be smooth and easily cleaned, and possible germ traps such as the juncture of sink and bench tops should be carefully sealed. Storage cupboards require frequent cleaning and spilt food should be wiped up immediately.

Good ventilation is important and when window space is restricted a fan inserted in window or wall will remove food odours and provide good circulation of air. Louvre windows require little space and also give good ventilation without creating a draught.

Both day and artificial lighting should be adequate, eliminating the possibility of dark corners where dirt might accumulate or the imperfect washing of food and utensils.

Clean Washing up

As dishes and cooking utensils can also act as carriers of infection, particularly of the saliva-borne type such as colds and influenza, washing-up methods should be clean. In most homes washing up is done by hand, but whether a machine is used or not the first essential is to remove food residues. Scientific study of effective methods of cleaning tableware which has been carried out in school and factory canteens, public houses, and restaurants has shown that the most satisfactory results for preventing bacteria development were obtained when two sinks were used, the first for washing and the second for rinsing and sterilising in clean water at a temperature of 180 degrees F. The dishes were dried in air without use of a drying cloth.

In the home this procedure may not be practicable, but an attempt should be made to reach as near these standards as possible. Careful scraping of dishes with a rubber scraper or soft paper, washing in clean hot water with soap or detergent, and rinsing in clean water at a high temperature followed by air drying should result in the dishes having a low bacterial count. Use of a dish mop instead of a dish cloth will enable much hotter water to be used. If towels are used for drying, they should be boiled frequently, and dish cloths and mops should be treated similarly. Direct sunlight has a germicidal effect and hanging mops and cloths in the sun to dry is beneficial.

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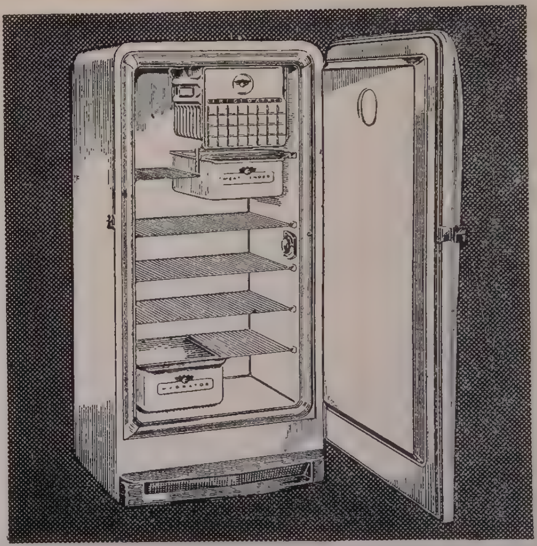

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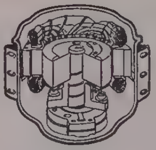

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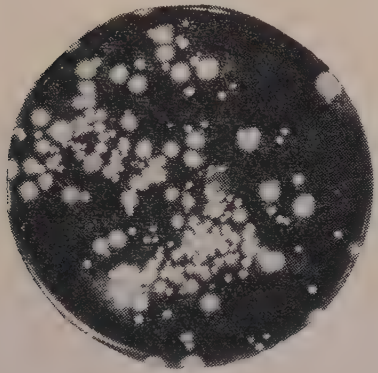
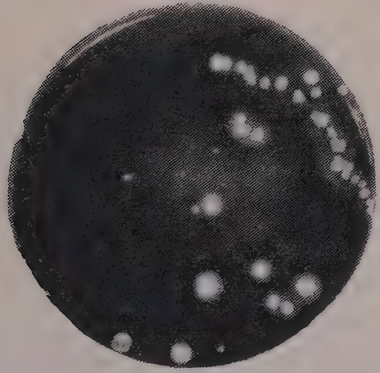


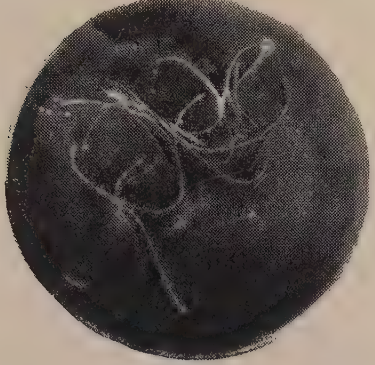
After a fly had walked across it.



Effect of a cough spray.

Where machine washing methods are used the washing temperature should not be above 140 degrees F., but the temperature of the rinsing water should be from 170 to 180 degrees F. Suitable soap powders or detergents should be used for the removal of grease, and the rinsing water should provide sufficient fresh water to replace the wash water frequently. Provided the water is at the required temperature and changed often enough and the dishes are dried by evaporation, machine washing will also produce dishes with a low bacterial count.

Garbage Disposal



Germs on human hair clearly show the need for head covers.

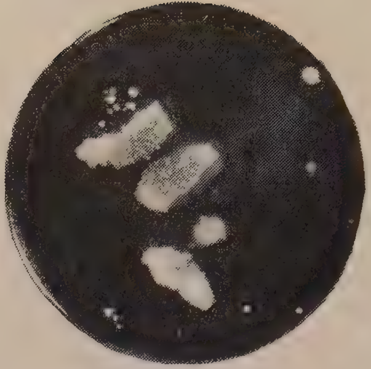
The photographs on this page, taken under a microscope and reproduced from "Health", show how dishes may be contaminated by germs and illustrate clearly the need for all precautions to be taken by those handling food.

City and county by-laws stipulate certain rules for the disposal of garbage, because waste matter provides excellent breeding grounds for flies and bacteria. Every adult should aim at strict adherence to these laws for his own health's sake and that of his neighbours. Household garbage should, whenever possible, be burnt, but when burning is not feasible food waste should be well wrapped in paper and placed in a metal receptacle with a tight-fitting lid. This should be washed and disinfected regularly. In cities garbage is disposed of by the council, but in the country the householder is responsible for the frequent emptying of the rubbish receptacle and destruction of the rubbish. To combat the fly menace burning or burying of kitchen refuse is the most effective method of disposal. If the material is required for the making of compost, it should be dusted or sprayed with D.D.T. and placed in a properly constructed and covered compost bin. This will ensure the extermination of any grubs as they come to the surface. So-called compost heaps which are merely a mass of untreated, decomposing vegetation are a menace, as they are ideal breeding grounds for house flies.

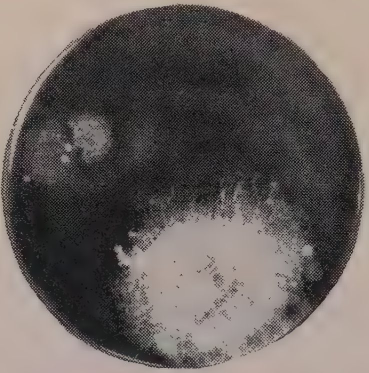
Certain food waste may be used profitably for animal or fowl food, but the practice of throwing food scraps indiscriminately to birds or animals is to be condemned, as it frequently attracts rodents and flies.

The cleanliness of privies, fowl-houses, kennels, pig sties, cow yards, and stables is of great importance, because even when they are situated at the stipulated distance from a dwelling, they may be a danger to health. Flies will travel considerable distances carrying virulent disease germs from neglected outhouses.

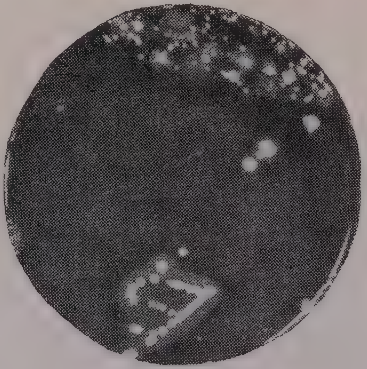
Household Pests



The result of the plate being touched by lips, showing how the rims of cups and glasses may be contaminated.



This plate was touched lightly by the finger tips.



A cup washed by the ordinary method was swabbed to inoculate this plate. The need for proper sterilisation is obvious.

Rats and mice as well as flies are disease carriers, and other pests such as cockroaches, ants, and mites can taint food by secretions and droppings. Good housekeeping is the first measure of control and cleanliness of kitchen, storerooms, and cupboards will reduce the possibility of infestations. Places where rodents can gain access should be blocked, and fly-proof netting is an excellent method of controlling flies. Advice on specific problems should be sought and advantage taken of effective insecticides. It is not within the scope of this article to deal with such measures, but as flies constitute the greatest nuisance, a simple, home-made treatment using a burning strip deserves mention.

The materials required are 2 tablespoons of 16 per cent. wettable "Gammexane" (sold as a proprietary preparation) and 2 teaspoons of saltpetre. Dissolve both in a small quantity of water. Cut strips of absorbent paper about 6in. by 1in. Dip these into the mixture. Remove the strips and allow them to dry in the sun or on top of the stove. Pack them in an air-tight tin. Close doors and windows and burn one strip on a shovel in the closed room. This will kill any flies present and remain effective for several days.

Food Storage

Bacteria require moisture and warmth for growth, and certain foods are more susceptible to contamination than others. Foods deteriorate most rapidly at blood heat (98 degrees F.), less rapidly at room temperature (64 to 68 degrees F.), and at a temperature below 50 degrees F. bacterial growth is retarded, although existing organisms are not destroyed. Safes and storerooms should be kept as cool as possible, have free circulation of air, and be free from damp. Refrigeration plays an important part in preventing bacterial growth, but has certain limitations. Humidity affects food adversely and for this reason overloading of or placing warm food in a refrigerator should be avoided. Many foods can be stored for long periods in deep-freeze cabinets, but in the usual type of home refrigerator, which is maintained at temperatures of 40 to 50 degrees F., slow changes take place and perishable foods should be used within a few days. When food is removed from the low temperature bacterial growth is rapid and it is important therefore to use or cook foods as soon as possible. After being cooked, food which is to be used cold should be cooled as quickly as possible. This applies to such foods as corned beef or gelatine desserts.

Special Precautions for Certain Foods

Special precautions are necessary with certain foods which have been responsible for outbreaks of food poisoning.

Meat, Meat Products, and Fish

Meat which has been frozen drips badly when thawing out and this drip is particularly favourable to bacterial development. Therefore the meat should not be allowed to rest in this liquid when thawing nor should the drip be used in gravies unless it has been thoroughly boiled.

Processed meats such as mince, sausage meat, or brawn may be contaminated during processing and should not be held in storage whether in or out of refrigeration. When sausages are being fried it is difficult to raise the internal temperature to sterilisation point without overcooking the outside, but baking in the oven achieves this successfully. With mince also prolonged cooking is necessary to ensure that all particles reach a temperature high enough to destroy bacteria.

Reheating meats also is dangerous, as too much cooking spoils the flavour and too little will not heat the interior sufficiently to destroy bacteria. Pies consist of meat enclosed in pastry, which increases the time necessary for thorough heating, and slow heating like slow cooling is favourable to bacterial growth.

Fish presents the same problem as meat. It should not be fried too quickly, particularly if coated with batter, as the outside will burn before the necessary internal temperature is reached.

Milk Products

Pasteurisation destroys dangerous bacteria in milk and this treatment receives strong medical support. Home pasteurisation can be carried out very easily in the following way:—

Place the milk in the top of a double boiler with cold water underneath. Raise the temperature of the water to boiling point and boil for 5 minutes. Remove the milk, cover, and cool rapidly.

Even when pasteurised, however, milk still ages, and should be used while fresh and should be hygienically handled to prevent re-infection. Similar precautions are necessary with unsweetened tinned milk or cream, and dried milk should be reconstituted immediately before use.

Desserts

Desserts made from milk, eggs, and gelatine which have not been subjected to high temperatures are also a good medium for bacterial growth. Cases of food poisoning have been traced to such desserts which have been left in a warm atmosphere. Duck eggs should never be used in uncooked dishes, as they are sometimes infected with bacteria of the salmonella group or poisonous staphylococci.

Non-acid Foods

The home preservation of non-acid foods such as meat, fish, peas, and beans should be done only by recommended methods, as the lack of acid makes safe preservation more difficult. Unless a pressure cooker with a gauge has been used for processing, all such foods, even though they smell and appear normal, should be boiled for 15 minutes before being used.

Much is being done by health authorities to improve conditions and make food safe, but much still remains for individual effort.

Attainment of satisfactory hygienic conditions is not a matter of elaborate kitchens and complicated gadgets, but requires combined operations involving:—

Persons, foodstuffs, service hygiene, equipment, premises, and vermin control.

Ham Cornets

NO cooking is required for ham cornets, which are made from thin slices of ham or luncheon sausage, a breakfast cup of any cooked, cold vegetables cut into small cubes, 1 tablespoon of mayonnaise, 1 hard-boiled egg, lettuce, and chopped nuts.

Mix the vegetables with the mayonnaise. Roll the slices of ham into the shape of cornets, lay a slice of hard-boiled egg just inside each opening, and fill up the cornets with the vegetable mixture. Serve on a round plate with the points of the cornets to the centre. Garnish with lettuce or endive and chopped nuts.

Uses of
NEW ZEALAND GRAPEFRUIT

MANY New Zealanders in recent years have been rather surprised to discover that the present-day New Zealand grapefruit is very different from the wry-flavoured Poorman's Orange of the past. The versatile and valuable New Zealand grapefruit is available for at least 6 months of the year, with the best supplies in late spring, when other fresh fruits are very difficult to obtain. When marmalade making, for which the fruit maturing about June but not fully ripened is used, is over for the year there are very many ways in which the sweet, juicy, tree-ripened grapefruit can be used to give variety to daily meals. Recipes for salads, sauces, desserts, appetisers, and drinks are included in this article by Norma K. Metson, formerly Field Officer in Rural Sociology, Department of Agriculture, Wellington.

WHEN supplies of citrus fruits are plentiful and cheap consumption rapidly reaches high levels, as it has done in the United States over the last 30 years. One large grapefruit provides at least half the day's requirement of vitamin C, so nutrition authorities recommend frequent servings of such a rich and reliable source of this important food factor. Retail prices of New Zealand grapefruit are seldom very low, but the fruit can frequently be bought cheaply by the case, and in some areas supplies are liberal. Also, there are many districts where one or two trees planted in the home garden will give good returns, though it would not be safe to establish commercial orchards.

The trees require a well-drained situation, such as a warm hillside, where frosts will be very light, a regular rainfall of 3 to 4in. per month or its equivalent in watering, and shelter. A tree will begin to bear at about 5 years, and at maturity (10 to 12 years) should have a crop of 3 to 4 bushels annually. A number of New Zealand orchards are now gradually increasing production, so total output of the fruit can be expected to rise for some years.

When the fruit is bought those selected should be evenly ripened, and weigh heavily for their size, as this indicates juiciness. Those which have a very soft or very hard peel should be avoided, as a soft peel usually indicates staleness and a hard one immaturity. Thickness of peel is partly a characteristic of variety, but in general thin-skinned fruits are to be preferred, as they have a better flavour and more pulp and juice. Proper curing of the fruit helps to make for thinner skins.

Preparation and Serving

From the housewife's point of view one of the biggest advantages of grapefruit is that they can be made into a large variety of attractive dishes with little or no cooking. To peel grapefruit easily pour boiling water over them and let them soak for a few minutes. The skin will then lift off readily, leaving the whole fruit, which can be sliced or separated into segments. However, the membranes, which may be rather tough, are not removed. Alternative methods are to peel the fruit with a sharp knife, cutting through skin and membrane so that the flesh is exposed and can be lifted out in segments; or to cut the fruit in half and remove the half segments by using a special grapefruit knife which is serrated on both edges and has a curved point (see upper illustration on page 493). A serrated blade is more efficient than an ordinary knife for cutting and slicing grapefruit.

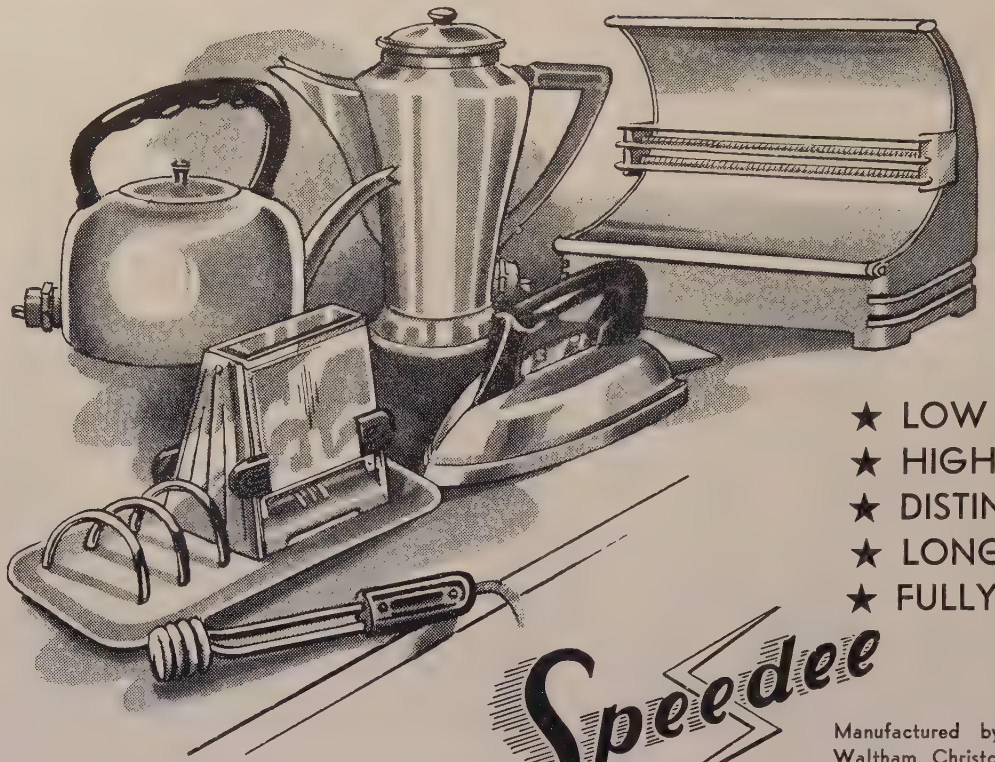
Recipes

Breakfast, Entree, or Dessert

The following methods may be used to prepare grapefruit as a breakfast fruit, entree, or simple dessert.

Cut the fruit in half crosswise, cut out the white centre core, and loosen the pulp by cutting round the outside and between the segments with a grapefruit knife. Sprinkle the fruit with white or brown sugar or drizzle a spoonful of thin honey over it. Prepare the fruit overnight. It may be chilled before being served. For additional flavour and colour add a teaspoon of sherry to each half and put a glace cherry in the centre of each half, or add a little ground cinnamon, nutmeg, or clove to the sugar. Slices about ½in. thick peeled or unpeeled may be flavoured similarly and arranged attractively on a flat dish or on individual serving plates. For a hot dish prepare the fruit as described, add a teaspoon of butter to each half or slice, and bake or grill the pieces until they are heated and lightly browned. A very attractive serving can be made by removing the pulp from each half shell, mixing it with small amounts of other fruit such as sliced bananas, stoned cherries, diced pineapple, or melon, adding lemon juice and sugar to taste, and piling the fruit mixture back in the grapefruit shells with a colourful garnish on top.

HEADING PHOTOGRAPHS: Right—Chilled grapefruit punch. The glasses are frosted by dipping the rims into a saucer of fruit juice and then dipping them into a plate of sugar. Photograph of grapefruit at left by Sparrow.



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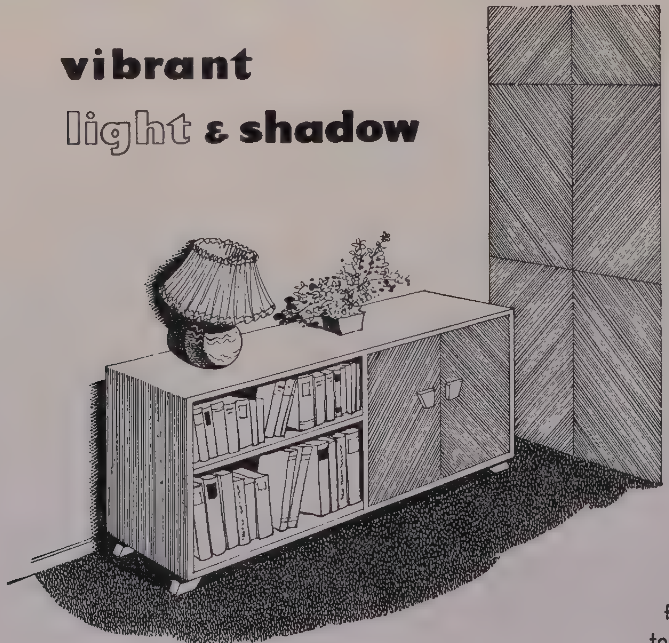

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WT.3

Salads

Grapefruit are suitable for all types of salads, sweet or savoury, jellied or plain. For serving in salads the fruit should be peeled with a sharp knife and either sliced or the segments lifted out from between the membranes.

Here are some suggestions for salad combinations which may be served in lettuce cups or on finely shredded cabbage.

Make small balls of cream cheese or of ordinary cheese grated and moistened with salad dressing or cream. Roll the balls in finely chopped celery, nuts, parsley, or chives and place them on grapefruit slices or in a nest of grapefruit segments.

Cut bananas into 1in. lengths, dip them in salad dressing or lemon juice, then coat them in chopped nuts. Mix these pieces with an equal quantity of grapefruit pieces rolled in chopped parsley.

Pile grated raw carrot on grapefruit slices and top with cooked green peas, tree tomato slices, or thin strips of green pepper (see illustration below).

Pineapple, either raw or tinned, makes a delicious salad combination with grapefruit, but its use might be regarded as a little extravagant for an everyday meal.

Mix grapefruit sections with about ⅓ the quantity of chopped dried fruits—raisins, prunes, or sultanas—and lettuce and a good seasoning of finely chopped mint. Garnish the salad with a sprig of mint and a piece of crystallised cherry or ginger.

Half segments of fruit are removed by a special grapefruit knife.

A luncheon salad which includes grapefruit segments and is garnished with lemon slices and mint.

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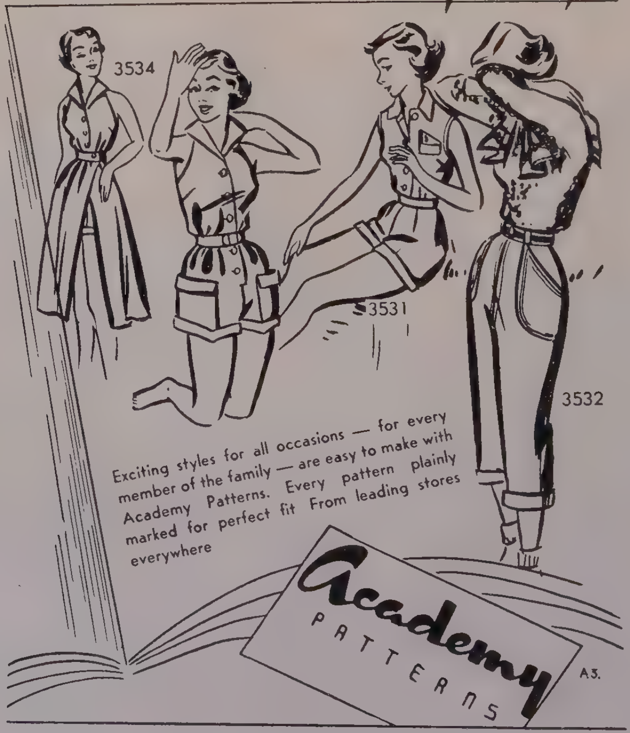

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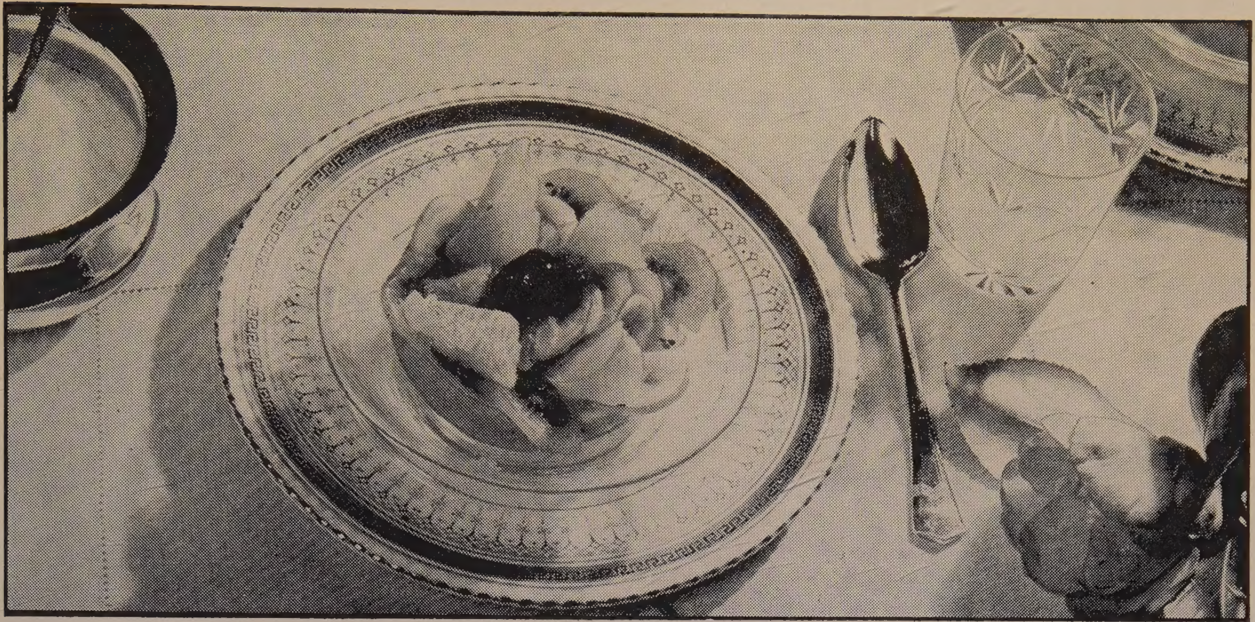


Grapefruit segments and chopped mixed fruits piled into half a grapefruit skin to be served as a dessert.

Jellied Grapefruit Salad (Savoury)

- 1 packet of lemon or lime jelly
- 1 cup of hot water
- ¼ cup of sugar
- ¾ cup of grapefruit juice
- ¼ teaspoon of salt
- 1 tablespoon of lemon juice or vinegar
- ½ teaspoon of minced onion
- 1 cup of grapefruit segments

Dissolve the jelly in the hot water, add the next 4 ingredients, stir until the sugar is dissolved, and leave the mixture until it is thickened and partly set. Fold in the onion and the grapefruit and set the jelly in one large mould or several individual moulds. Serve the salad in crisp lettuce cups.

A sweet jellied salad can be made from the same recipe by omitting the salt, lemon juice, and onion and adding a small quantity of some other fruit—fresh, dried, or bottled.

Sauces

Plain Grapefruit Sauce

- 2 tablespoons of cornflour
- Grated rind and juice of 1 large grapefruit
- 2 tablespoons of sugar
- 1 cup of water
- 1 tablespoon of butter

Mix the cornflour with a little water and add this mixture to the remaining water, which has been heated with the sugar. Stir the mixture until it has thickened and cook it for a few minutes. Add the juice and grated rind, reheat the mixture to boiling, and add the butter just before serving the sauce.

Savoury Grapefruit Sauce

(To serve with roast poultry)

- ½ pint of white stock
- 3 tablespoons of chopped celery
- 1 tablespoon of cream or top milk
- 2 egg yolks
- 1 tablespoon of butter
- Grated rind and juice of 1 large grapefruit

Put the stock, celery, and grated rind in a saucepan, bring them to the boil, simmer them slowly for 15 minutes, and strain them. Return them to the pan and add the strained juice. Bring the mixture to the boil again, remove the pan from the heat, and add the egg yolks and cream. Keep the mixture hot, but do not allow it to boil, and stir in the butter just before serving the sauce.

Fluffy Sauce

- ⅓ cup of sugar
- Grated rind of 1 grapefruit
- Juice of ½ lemon
- Pinch of salt
- 1 or 2 grapefruit (to give ½ cup of juice)
- 2 eggs (separated)
- ½ teaspoon of vanilla

Mix the first five ingredients and add them carefully to the well-beaten egg yolks. Cook the mixture over hot water, stirring it constantly until it is thick. Beat the egg whites stiffly and add them gradually with the vanilla. Serve the sauce hot.

Whipped Cream Sauce

- 2 egg yolks
- ¼ cup of sugar
- 1 medium grapefruit
- 1 cup of cream or unsweetened condensed milk

Beat the egg yolks until they are very thick, then add the sugar and beat them again. Stir in the juice and grated rind of the grapefruit. Cook the mixture over hot water, stirring it frequently, until it has thickened, then leave it to cool. Whip the cream and fold the cooled custard into it. If desired, add 1 to 2 teaspoons of lemon juice. Serve the sauce with fruit whip, marshmallow, white sponge cake, or any other dish which uses only egg whites.

Pineapple and Grapefruit Sauce

- ¼ cup of sugar
- Grated rind of 1 grapefruit
- 1 dessertspoon of cornflour
- 1 cup of water
- 1 cup of grapefruit juice
- ⅛ cup of finely grated pineapple

Mix all the ingredients in a saucepan, bring them to the boil, and boil them for 3 minutes. This makes a thin sauce suitable for serving with steamed puddings or gingerbread. Mashed banana or other fruit pulp may be substituted for the pineapple.

Desserts

Baked Grapefruit Souffle Pudding

- 2 eggs (separated)
- 2 tablespoons of flour
- ¼ cup of grapefruit juice
- 1 tablespoon of lemon juice
- ¾ cup of sugar
- 2 tablespoons of melted butter
- 1 teaspoon of grated lemon rind (optional)
- ¼ teaspoon of salt

Beat the egg yolks with the sugar, add the remaining ingredients except the salt and egg whites, and mix them well. Lastly fold in the egg whites, which have been beaten stiff with the salt. Pour the mixture into a greased pie-dish, place the dish in a larger dish of water, and cook the pudding in a moderate oven (350 degrees F.) for 35 minutes.

Grapefruit Whip

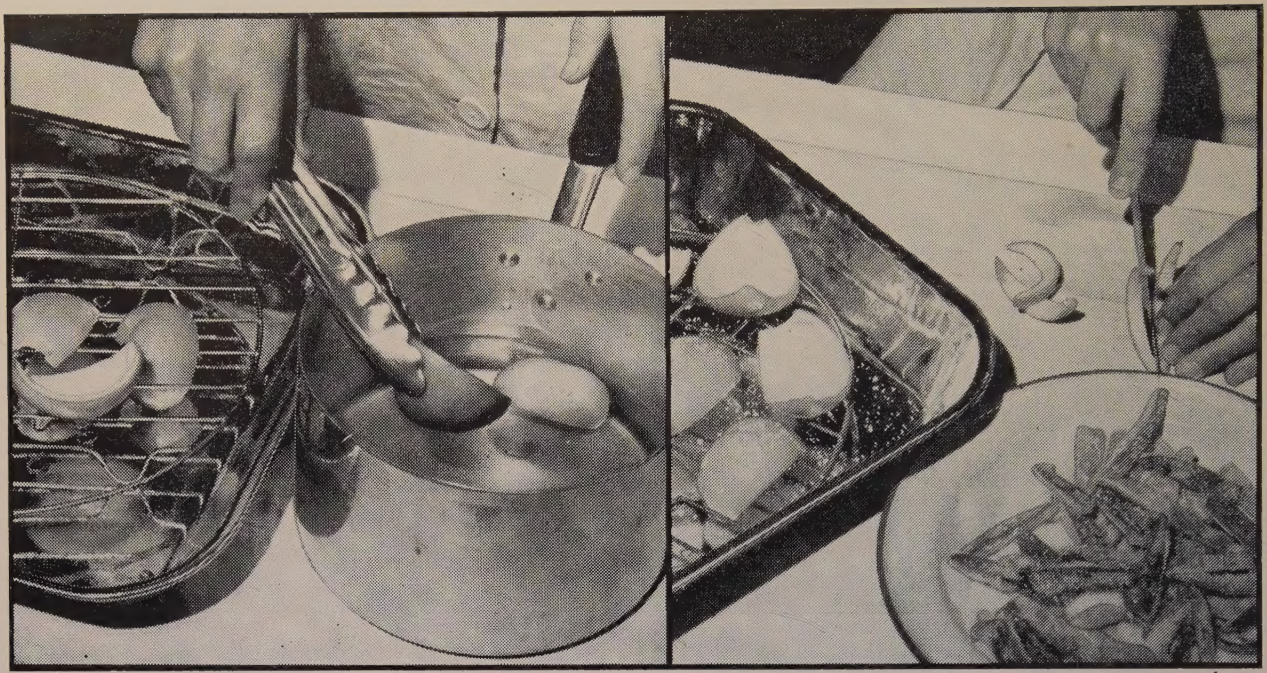
- 2 tablespoons of gelatine
- 1½ cups of grapefruit juice
- 1 cup of thick custard
- ¼ cup of chopped nuts (optional)
- ¾ cup of sugar
- ¼ cup of lemon juice
- ¼ cup of cold water
- ½ cup of hot water

Soak the gelatine in the cold water for a few moments, then dissolve it in the hot water. Add the sugar to the fruit juice, then add the dissolved gelatine and stir the mixture well. Set it aside in a cool place. When the jelly has thickened and is beginning to set beat it thoroughly with a rotary beater until it is white and foamy. Fold the custard and finely chopped nuts into the fruit mixture. The amount of fruit juice may be decreased and of water increased if the total volume is kept the same.

Grapefruit Tart

- 1 tablespoon of gelatine
- ¼ cup of cold water
- 4 eggs
- ½ teaspoon of salt
- Prepared 9in. pie crust
- ¾ cup of sugar
- 1 tablespoon of lemon juice
- 1 cup of grapefruit pieces and a few whole segments
- Whipped cream

Soak the gelatine in the cold water. Beat the egg yolks, add the salt, half



Making candied peel. Left—The cooked peel is lifted from the hot syrup on to a wire draining rack. Right—The dried peel may be cut up and dipped into sugar before being stored.

the sugar, and the lemon juice, and cook the mixture over hot water until it has thickened. Add the gelatine, stirring the mixture until the gelatine dissolves, and the grapefruit pieces. Put the mixture aside to cool. When the gelatine mixture has partly set beat the egg whites to moist peaks, beat in the remaining sugar, and fold the meringue into the gelatine mixture. Heap the mixture lightly in a prepared pie crust, and when it has set garnish it with whipped cream and grapefruit segments.

Grapefruit Ambrosia

1 packet of lime or lemon jelly crystals
½ cup of hot water
1 cup of grapefruit juice
1 egg white
½ cup of cream
¼ cup of sugar
½ cup of desiccated coconut
Grapefruit segments

Dissolve the jelly in the water, heating them a little if necessary to make sure the gelatine is properly dissolved. Add the grapefruit juice. Chill the mixture until it is beginning to set, then beat it. Beat the egg white, beat in the sugar, and fold the meringue into the jelly. Also fold in the coconut and the whipped cream. Allow the mixture to set and decorate it with the segments of grapefruit and whipped cream. Serve it with a thin custard made with the egg yolk.

Drinks

Grapefruit Syrup

1½ cups of grapefruit juice
1 cup of water
2 cups of sugar
¼ teaspoon of salt

Boil the sugar and water for 5 minutes; strain the syrup into the grapefruit juice and salt. Allow the syrup to cool and dilute it with water to taste.

Grapefruit Punch

½ cup of sugar
1 cup of water
1 cup of grapefruit juice
½ cup of lemon juice
½ cup of strong tea
2 cups of iced water, soda water, or ginger ale

Heat the sugar and water to boiling point, then cool the syrup. Add the remaining ingredients. If soda water or ginger ale is used, do not add it until just before the drink is to be served.

Candied Peel

For candied peel choose fairly thick peels and cut them in halves if small and quarters if large. Soak the pieces overnight in salted water (1 teaspoon of salt to 1 pint of water), then for a few hours in fresh water. Boil the peel in fresh water for ½ hour. Drain the peel, then measure sufficient water to cover it, make a syrup with the water and an equal amount of sugar. Add the peel when the syrup boils, and simmer the syrup gently, with the lid on the saucepan, until the peel is tender enough to be pierced with a match stick. Remove the peel to a wire rack and dry it in the sun for 3 to 4 days or in a cool oven. Make a fresh syrup, using 2 cups of sugar and 1 cup of water to every 1lb. of peel. Add a pinch of cream of tartar and boil the syrup to the soft-ball stage. Dip the peel in the syrup, remove it to a wire rack, and pour syrup in the hollows. Dry the peel thoroughly and store it in an airtight jar.

Citrus Pectin Extract

Pectin is a constituent necessary for the setting of jams and jellies. Some fruits are deficient in it and others are particularly rich. The addition of a small amount of prepared pectin to strawberries, raspberries, rhubarb, and slightly over-ripe fruits will result in good sets and attractively coloured jams after a minimum of boiling. Liquid pectin can be bought, but it can also be prepared at home from the white skin of grapefruit and other citrus fruits, a particularly rich source.

The ingredients are:—

½lb. of white skin from grapefruit
6 cups of water
3 tablespoons of lemon juice

Remove the yellow rind from the fruit by grating or peeling very thinly. Take off the white skin and mince it, add the water and lemon juice, and leave the mixture overnight. Bring it to the boil and again leave it overnight. Next morning boil the mixture for 15 to 20 minutes, then strain it. If there are more than 2 cups of liquid, boil it rapidly until it is reduced to that amount. Bottle the mixture boiling hot in small sterilised jars and seal the jars immediately. The jars should be shaken when the pectin is to be used. The extract will not keep once the jar has been opened. Pectin is added after sugar when jam or jelly has been brought to boiling point. The amount needed may vary from 1 tablespoon to 1 cup to every 2 cups of fruit juice, and must be determined by applying the pectin test as follows:—

To 1 tablespoon of fruit juice add 1 tablespoon of methylated spirit. Add the pectin extract, ¼ teaspoon at a time, stirring the mixture after each addition until a thick clot is obtained. From this test the amount of pectin to be added per cup of juice may be calculated; for example, if ½ teaspoon of pectin is required to clot 1 tablespoon of juice, the proportion is 1 : 6, that is, 1 cup of pectin extract is required for 6 cups of juice.

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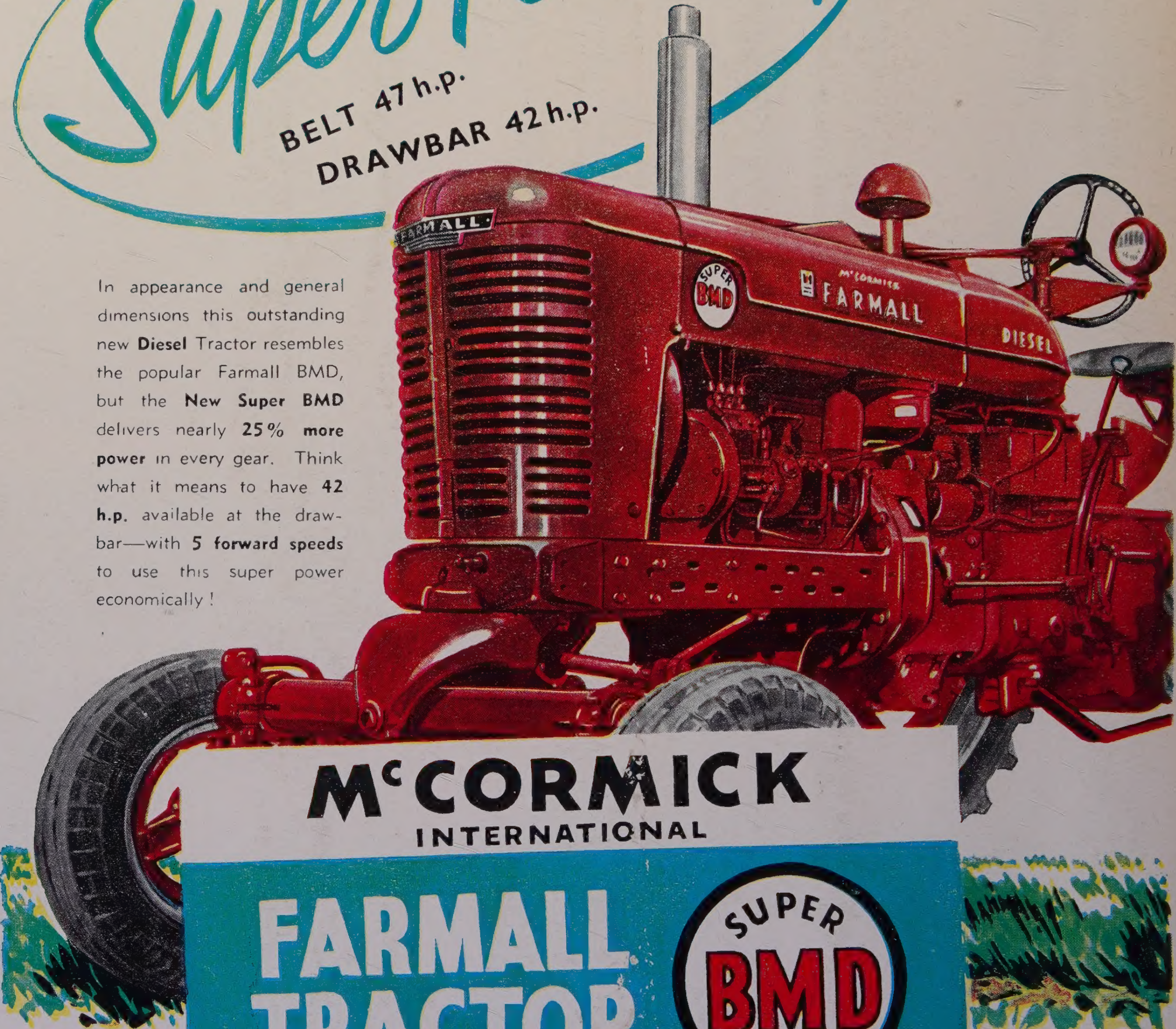

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